I & C

App. F. IX-4

1939.
(3 & 2)

File No. 415-39

Serial Nos. 1

Previous References

A+E 183-33 (1-2, 9-12, 14, 16-18, 22, 24, 25).

Later References.

I&C 500-39-1
" 608-39-1
" Dep. 640/40.

GENERAL AND REVENUE SECRETARIAT.

80

Serial Nos.

Part B for January 1940.

SUBJECT.

Question of manufacturing superior jaggery and sugar by open Pan System requiring only Rs 20,500/- capital devised and advocated by Mr H. C. S. Paterson, Agricultural Engineer Bihar.

The question may be dropped.

WD 0573—GPB—22,500—12-9-39

26/1

DEWAN'S OFFICE
24 JUNE 1935
No. M 1482

DEWAN'S MINUTE.

FILE No. 193 . 5994

DEWAN'S OFFICE
15 JULY 1935
No. 86

SUGAR FACTORIES

NEW TYPE NEEDING ONLY RS. 20,000 CAPITAL

Mr. H. C. E. Peterson, a Bengal Government agricultural engineer at Dacca, after years of experiment has devised a small open pan sugar requiring only Rs. 20,500 capital.

The recent tariff concession granted by the Government has given an impetus to the sugar industry, which appear to have immense possibilities in this country, coupled with encouragement given to cultivators by the distribution of over 10,000,000 cuttings.

Several factories of this type have been started, including one at Rajshahi for demonstration purposes—by the Government and others in various districts in Bengal.

It is expected that they will considerably help educated young men to get a start in industrial life with a small initial capital and a fair return of the amount invested.—*Associated Press.*

The Statesman - June 35

It seems well worth getting some information about these factories. Have our Sugar Factory got any information?

MJ
23-6-35

Dev. Secy

GEN. & REV. SECTION.
25 JUNE 1935
DEVELOPMENT BRANCH.

2 We may write to the Secy Sugar Board & Director I&C

MV.
24.6.35
25/6

3 Dft Sub
26/6/35

4 Issue
26/6

Issued No. D. 8053 dt 29/6/35

COPYING SECTION.
27. JUN. 1935
GENL. & REV. SECTT.

GEN. & REV. SECTION.
27 JUN 1935
DEVELOPMENT BRANCH.

"COMMERCE AND INDUSTRY". 2146

29th October 1935.

---

7 NOV. 1935

BENGAL SUGAR INDUSTRY.

5) The Bengal Government have been taking keen interest in the improvement of the sugar industry hoping to relieve unemployment in the Province by its development. They feel that the improved 10-ton gur and sugar mill which has been introduced by the Bengal Agricultural Department would be quite suitable and profitable. This factory can deal with 250 maunds of cane a day and manufacture 35 maunds of rab a day from this cane, if the quality of the cane is good.

6) Detailed calculations have been made to show that with an outlay of Rs.15,000 it would be possible to effect a turnover of about Rs.2,300 a season if the factory crushes to its full capacity of 250 maunds and work 120 days in the season.

7) The Government of Bengal have also given an assurance that industrialists requiring help for the erection of this type of factory would receive it from the Agricultural Engineer of Bengal and the Bengal Agricultural Department. Help would also be given during the working of the factory, and what is more, if necessary, a few experienced hands on moderate salaries would be provided by the Department to work the factory in the first season and to teach local labour.

'EXTRACT'

OFFICE OF THE SECOND MEMBER OF COUNCIL. 7 NOV. 1935 No. M1S

Give copy with compliments

8) Detailed information may be obtained about the improved sugarcane mill referred to above — if it has not been called for already.

7/11/35

Serial No.

Subd with the previous papers
to the Ir Member's minute
~~For kind perusal.~~
11/11/35 ~~(The Dr of Ptg & the Hon'ble Sec. Algoma Sugar Factory have been reminded & cuts here replies are awaited)~~
~~Second Member & Dirr~~

Ir Subd for kind perusal -
The letter from the Secy Sugar Factory dated 10-10-35 is placed in the file -
The Director of Ptg's reply is awaited
Second Member 18/10/(11)

36 42

II
14/11/35

From The Director
No. D. 5-6/35-36 d 29/5/36
Forwards copies of letters 27/7/35
d 26/3/36 from the Agri-Supr to the
Govt of Bengal regarding the
of the New Type Sugar factory
and requests sanction to depute
an officer of the to watch the
working of the machinery etc. & to collect

NOTE.—Contn. Sheet.

File No. of 193 .

General and Revenue Secretariat

12 [illegible] 1, 14, 17 [illegible]

[illegible]

M.

13 The Agricultural Engr. to Govt. (Mr. Peterson) who seems to have considerable practical experience of the working of these new types of sugar factories has given very favourable accounts of them both from the commercial and from the financial points of view. I think his opinion is entitled to greater weight than that of the Secy. of the Upper Ganges Co who has no experience of the manufacture of sugar and [illegible]

General & Revenue Secretariat. | File No. of 193 | [App. F. III–2

Serial No.

from small scale factories of the new type. It may be that Mr. Peterson's estimate of 19% profit may be a bit sanguine. Even if the yield on the capital investment is not more than 8 to 10% it seems ~~to be worth while~~ worthwhile to study these new types with a view to find out their ~~suitability~~ suitability to our local conditions. ~~If~~ These small units if found suitable, will offer a solution to the pressing problem which faces us in areas where the growth of sugar cane is not sufficient to feed a big modern factory of the type we have in Mandya. In this view it seems desirable to sanction the proposal of the Dr to depute a competent officer to go to Bengal and study the working of the factories and submit a detailed report.

Dr. 7.7.36

The study of the Coimbatore plant is cheaper than Kalyanpur more useful. For orders.

Secy to Govt

Dr. 9.7.36

Gov. 9.7.36

OFFICE OF THE SECOND MEMBER OF COUNCIL. 9 JUL 1936 No. 245

NOTE—Contn. Sheet.

15 The Dir, I&C may be asked to submit detailed proposals for deputing an officer of the Dept to study the working of a factory of the type advocated by the Agrl Engineer, Bangl.

The factory at Suganellur in the Coimbatore District is apparently an experimental plant and I am not sure that any factories of this type have been successfully established on a commercial basis. If there are any such which are worth visiting, the officer to be deputed may see these factories also.

12/7/36.

16 I believe there is one in Rajahmundry working on the Coimbatore Model. Full information may be obtained from the Director in addition to above.

17/7

To the Director of I&C

Letter no D. 582 dt 22.7.36.

Calls for detailed proposals in this matter and enquiries if there are any such places worth visiting by the officer to be deputed & calls for full information re working of the Sugar factory at Rajahmundry

1936-37

GENERAL AND REVENUE SECRETARIAT.

(A 48)

NOTES.

File No. 109-36

FILE HEADING.

Manufacture of [illegible] by open pan System

FROM The Director [illegible]

No. D5-6/35-36 Dated 16/11/36 Received 17/11/36

Diary No. 2541 | Enclos. 1 | Spare copies — | Serial No. 1

BRIEF ABSTRACT OF LETTER

Encloses a note showing how the manufacture of sugar by the open pan system is not a practical proposition under prevailing market conditions in India especially in the [illegible]

NOTES AND ORDERS.

19

Subs for perusal & orders with refces.

Dev Secy 25/11/36

2 5/11/36 Please pick up a copy of the commerce note published by the Imperial Council of Agr. Research.

1.12.36.

1/12/36

20

Subs with a copy of the press note as published in

WD 69—GBPM—5,000—14-7-31

Manufacture

File No. 109 of 193 . . General and Revenue Secretariat

the Madras Mail d 16/11/36. If appd, full infn on the subject will be obtained from the Dir. of Agri. Research Institute, New Delhi.

Dir Secy

Please invite the attention of Dr Sc. Wheis and a report here to obtain full particulars.

Dpt Subd.

Issue
10.12.36

D 3901 dt 17-12-36 To The Dir of Ind + Commerce

Invites attention to press note of the Dir. of Public information under the heading "Manufacture of Superior Pagdy and Sugar by Open Pan method" and requests for a detailed report.

Letter No. A5-6/36-37 dated 1.10.1937 from the Director of Industries and Commerce in response furnishing his views on the question of manufacturing superior paggery and sugar by the Open pan method

P. T. O.

Serial No.

24 These papers relate to the question of manufacturing superior jaggery and Sugar by what is known as "Open Pan system". A precis of the foregoing correspondence on the subject is given below.

para 1 of the notes

25 In connection with a Press report that a new type of Sugar factory known as "Open Pan System Sugar factory" requiring a capital of Rs 20,000/- devised and advocated by Mr H.C.E. Peterson, Agricultural Engineer, Bengal, has been started in certain districts of Bengal, particulars regarding these installations were called for from the Secretary, Mysore Sugar Company, and the Director of Industries and Commerce in June 1935, with a view to examine the possibilities of starting such factories in the Bhadra Canal Area and elsewhere in Mysore. The Secretary, Mysore Sugar Co^y, while furnishing information regarding the new type of factory, stated that <u>certain experiments carried out by the Department of Agriculture in Mysore show that the manufacture of Sugar by the process known as "Open Pan method" is not a profitable proposition.</u>

"B"

"K"

26 The Director of Industries and Commerce, however, suggested that a technical officer of the Ag. Dept be deputed to study the working of the improved Sugar Cane Mill. Thereupon, he was requested to submit detailed proposals in the matter. Meanwhile, in connection

"V"

para 15 of the Notes

NOTE—Contn. Sheet

with the investigation of the question of starting a new Sugar Factory at Shimoga, Govt directed in their Order No. D. 3044-52 | A & E. 183-33-25 d. 4.11.1936 that pending re-examination, in due course, of the scheme, the Department of I. & C. should examine the possibility of establishing in the Bhadra Canal Area, one or more small factories employing open pan boiling and power driven crushing mills and centrifugal machines for making sugar. The Director was also requested to submit proposals for the deputation of an officer to study the working of these special plants and suggest which type or types could be introduced with advantage in Shimoga District on an experimental basis.

After a careful study of the question on information obtained from the Department of Industries, Madras, the Agricultural Engineer, Bengal, and the Director of Agriculture in Mysore, the Director of I & C (Mr S. G. Sastry) reported in November 1936 that the scheme of starting factories of the open pan system is not a practical proposition especially in Southern India. His views are based on the following

(a) the sugar made by the open process cannot compare with factory sugar,

(b) the output on cane cannot be more

Serial No.

than 50% of the factory recovery and also not more than 50% of jaggery, and it may pay only when the price of jaggery is about 1/4 the price of sugar;

c) jaggery made from first molasses and additional juice cannot keep good for long and it has to be sold immediately which is not practicable;

d) if second sugars are attempted, the proposition becomes uneconomic.

Again in February 1937, the Director of Industries (Mr. S. G. Sastry) reported that he had placed Mr K.V. Govinda Rao, Mechanic of the Deptt., who was deputed to Lucknow in connection with the Schubert's, on special duty to attend the demonstrations in open pan system of sugar boiling and that there was no necessity to depute another officer till after the receipt of the report from Mr Govinda Rao.

The present Director, Mr M. S. Ramachandra Rao, visited Nhow (Central India) in January 1938 where a factory for the manufacture of sugar by the open pan method on the lines advocated by Mr Peterson has been newly started. He says that there was nothing novel in the machinery used, neither in construction

'N'

Manufacture of Jaggery

A&G File No. 1124 of 19

Commercial and Industrial Secretariat

Serial No.

of the furnace men in the use of the boiling pans and the yields, both in the case of sugarcane crushing mills as well as of first and second sugars, nowhere approached the figures claimed by Mr Peterson. It is stated that even the smallest unit of a mill for making sugar on by the open pan method will cost in the neighbourhood of Rs 16,750, which is fairly excessive to induce people to take to sugar making in preference to making of jaggery. Mr. Ramachandra Rao further reports that it cannot be maintained that the extraction of juice from the cane will equal the optimum results obtained in large scale factories, and that while the combined yields of first and second sugars are never likely to be more than 7% as against 10% or more in large-scale factories. The quality of sugar in appearance, grain and cleanliness is stated to be much inferior to factory made sugar.

30. Taking all the circumstances into consideration, the Director is of opinion that the question may be dropped for the present. Subs for perusal and orders.

US 8/12

Dir 6/

11/12/39

SECY. DEV. DEPT. 11. DEC. 1939 MYSORE

THE DIRECTOR OF INDUSTRIES
No. Ad 32
28 DEC 1939
BANGALORE

No. Ik 5-17/940
39/Ad

32. I agree with the opinion of the Director of Industries. I do not think a recovery of 7% crystal sugar possible with the Open-pan and Centrifugal. The 70% extraction of juice claimed for Peterson's crusher seems also doubtful except with ~~canes~~ soft canes having low fibre percentage. The jaggery prepared from molasses would present a serious marketing problem. I think the question may be dropped.

Development Secy
with Compliments. 26/12/39.

D. of Ag

OFFICE OF THE
SECOND MEMBER OF COUNCIL,
29 DEC 1939
No. 5073

OFFICE OF THE
FIRST MEMBER OF COUNCIL
DEC 30 1939
No. 6236

33. II Member
I Member
Dewan

34. 31/12/39

Note—Contn. Sheet

File No. of 19

General and Revenue Secretariat.

Serial No.	

General and Revenue Secretariat. | File No. of 19 . | [App. F. III-2

Serial No.

"I"

GENERAL SECT. JAN. 19
4274

Submd.

Reference is invited to para 5 (1) of Gro. No. D. 3044-57 | A-E. 183-33-25 dt. 4-11-36. These papers may perhaps be received in the Sec. Branch.

N.S. 5/1/40

For favour of general

Con by

7/1/40

B

9/1

Mr Gnanamukappa
Please record with all references etc

9/1

NOTE—Contn. Sheet.

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE

General and Revenue Secretariat

15

No. D 8053-53A — Genl. Dated, Bangalore, 27th June 193

From

The Secretary to the Government of His Highness the Maharaja of Mysore, Development Department.

To The Director of Industries and Commerce in Mysore.
" Secretary, The Mysore Sugar Co., Ltd.,

Sir,

I am directed to forward herewith copy of an article under the heading "Sugar Factories - New Type Needing only Rs.20,000/- Capital" appearing in the Statesman and to state that Government consider it worth while to get definite particulars about these installations and to enquire whether any information on the subject is available in your office.

I have the honor to be,
Sir,
Your most obedient servant,

For Secretary to Government,
Development Department.

S.R.2

Appendix F.G—1

SUBJECT .....

.....

.....

Diary No. of letter replied to .....

General and Revenue Secretariat

( )

the *193* .

Date of issue 29. 6. 35

Signed by .....

Stats that Govt consider it worthwhile to get definite particulars about these installations and to enquire whether any information on the subject is available in your office.

List of enclosures .....

Copied by .....

Examined by .....

Section A&E

File No.

Serial No.

No. D 8053/Fuel 1.

To
1) The Dir of I&C
2) The Secy, The Mysore Sugar Co Ltd

Sir,

I am directed to forward herewith copy of an article under the heading "Sugar Factories — New Type Needing only Rs 20,000 of Capital, appearing in the Statesman and to enquire whether any information on the subject is available in your office.

I have etc

26/6

for Dy Sec

26/6/35

TELEPHONE NO. 301

FACTORY: MANDYA
(MYSORE STATE)

DEWAN'S OFFICE
16 OCT. 1935

THE MYSORE SUGAR COMPANY, LIMITED

TEL: ADD: 'MYSUGAR'

CODES USED:
A.B.C. 5TH EDN. & BENTLEY'S

"SANTHI BHAVAN"
SESHADRI ROAD
BANGALORE

Camp Dev. 15

BANGALORE 10th Oct. 1935

REF. No. G-3/238

GENERAL SECT.
11 OCT. 1935

The General Secretary to the
Government of His Highness the Maharaja of Mysore,
BANGALORE

Dear Sir,

For general
Secrt Ukul
Dewan

With reference to correspondence ending with your letter No. D 2366 dated 4/9th October 1935, I am forwarding herewith a copy of the letter of the Agricultural Engineer to the Government of Bengal, Dacca, addressed to the Company, in the matter of the new type of sugar factory proposed to be started with a capital of Rs.20,000/-.

I am also submitting herewith for the information of Government, a copy of similar circular letter issued by the Department of Industries, Madras, Both these are more or less what is known as 'Manufacture of Sugar by the Open Pan System' where crushing is done by power mill, evaporation is done by open pans and after cooling the massecuites, sugar is recovered by means of centrifugals. Certain experiments appear to have been carried out by the Department of Agriculture in Mysore, sometime quite early in the estate of Mr. Urugahally Krishna Iyengar and their conclusion appears to be that with a recovery of 5% in this centrifugal process, the manufacture of sugar by this process is not a profitable one.

RAS/CNV.

Encl.2

Yours faithfully,
THE MYSORE SUGAR CO. LTD:
R Ananda Ramaiah
SECRETARY.

"COPY".

DEPARTMENT OF AGRICULTURE,
B E N G A L.

No. 511-43.

From

The Agricultural Engineer to the
Government of Bengal, D a c c a.

To

The Mysore Sugar Co. Ltd.,
B A N G A L O R E.

Dated Dacca, the 13th July 1935.

Sir,

In reply to your letter dated 2-7-35, I have the honour to inform you that, owing to the very large number of enquiries received from many Provinces, in connection with the Improved Sugar Factories of departmental design, it is not possible to reply to each individually, especially as each ask for different information. Accordingly a general letter is being issued giving as much information on the subject as possible and enclosed with same you will find two estimates, one showing the initial expenditure in detail and the other a detailed estimate of working costs for this type of factory. Should you, after careful perusal of these estimates, desire to go further into the matter and require more information, I shall be glad to answer any questions or points raised.

1. The process of manufacture in these plants is very simple and can be learnt in a short time by intelligent people. No scientific knowledge is necessary, the whole factory can be worked by a gang of coolies, but is is recommended that educated young men be employed to work some of the machines on a moderate salary, with a view to reduction of unemployment.

2. The plant is practically automatic and some of the major operations usually carried out by manual labour in other types of open Pan factories are in these done by machinery.

3. These factories are economical in working, more so than other types of Open Pan factories and are quite efficient, the object being to make them as efficient as the average Vacuum Pan Factory. As depreciation, interest, working costs and overhead

charges are low, with a high efficiency and large capacity in proportion to the size and cost of the plant, profit is assured.

4. Both Gur and Sugar can be made and both of an excellent quality. In the detailed estimates of working costs a four months season has been shwon for the manufacture of sugar only, these months are January, February, March and April, but it would be more advantageous to work six months, November & December manufacturing Gur and the other four months sugar. During November and December in Bengal the cane will not have reached maturity, in other provinces the cane matures earlier, accordingly about two maunds of cane extra will be required in Bengal to make a maund of gur, but as the price of gur is at its highest during these two months the extra cost of two maunds of cane is easily covered by the higher price of gur.

5. Only 6½ to 7½ maunds of cane are required in these factories to make a maund of gur, the quantity of cane depends on its maturity and quality, an average of 7 maunds may be taken for the season.

6. The machinery installed in these factories, all of which are of improved design and thoroughly tested out are manufactured in India, by Messrs. Kumardubi Engineering Works Ltd., Kumardhubi P.O., Manbhum district, Behar and Messrs. Renwick & Co., Ltd., Kushtia P.O. Nadia district, Bengal.

7. Stocks of machinery are limited and it is requested that if you are interested and have definitely decided to erect a factory of this type, you will please inform me at your very early convenience to avoid disappointment as it is expected that there will be a great demand for these plants.

8. Several factories of the older and latest types have already been erected and have been working up to last cane season. These factories may be seen if desired, but if you wish to see them actually at work you will have to wait till next cane season, in which case it will not be possible to erect and work a new factory during next cane season.

9. I can provide three or four skilled men on moderate salaries

to work the factory and teach your local labour during the first season, but again the number of men available are limited and these men will be reserved in order of rotation, with respect to orders for plants and their services.

10. Sites for erection of these plants in Bengal can be suggested, but it will be necessary for you to visit and inspect the site and personally satisfy yourself of its suitability or otherwise.

11. The price mentioned in the detailed estimate of initial cost, is for a factory erected complete and ready to work, but this is only a general guide as to cost, in some cases it may cost more and in others less, it just depends on the value of material and labour at your particular place, whether you construct and erect the buildings and erect the machinery personally or have all this done by an expensive contractor.

12. Drawings of buildings, layout of machinery and layout plan of the factory can be supplied to those actually ordering the plants @ Rs.5/- per set. All drawings for machine bases etc., will be supplied free by the firm supplying the machinery.

I have the honour to be,

Sir,

Your most obedient servant,

D. N. E. PETERSON,

AGRICULTURAL ENGINEER, BENGAL.

TPR.
18/3/35.

"C.A.A. VII.

ESTIMATE FOR A 10/15 TON FACTORY.

Estimate for a small Open Pan system Sugar Factory of the Departmental type, which is the most up to date and efficient type of Open Pan Factory.

This Factory can deal with 300 maunds of cane per day and manufacture 48 maunds of rab per day from the above cane, if the quality of the cane be good and variety Co.213.

The layout of this plant is intended for working on the ordinary clarification process, by which process in two recoveries, manufacturing first and second sugar and if the cane is good, 54% sugar from rab can be obtained. It is probably more profitable to recover some 44% first sugar and convert the whole of the first molasses from the above sugar into Chakiyar. A chakiyar making machine is under design to manufacture chakiyar commercially in large quantities, as the process by hand is slow and expensive. With an extra rab pan or two furnaces added to the estimate below and an extra centrifugal, the capacity of this plant can be increased by another 50% per day.

ESTIMATE SHOWING INITIAL COST OF THE PLANT [illegible].

1. One 21 BHP Nat. Series "Peter" Crude Oil Engine [illegible] Rs. [illegible]/-
2. One Peterson's Improved [illegible] type [illegible] Mill to crush 45 maunds cane per hour [illegible] an average extraction of 70% juice on cane .. . 1450/-
3. One Peterson's Improved Latest K.B.type rab furnace to manufacture up to 8 maunds of the best quality rab per hour. Most economical in fuel, [illegible] generates a temperature of 1100° F in flue gas [illegible] fuel, practically double that any other furnace or Rab Pan uses, with less fuel 1100/-
4. One Peterson's Improved K.B.type Molasses Furnace with a capacity of 2 maunds finished second rab per hour. This is practically more than double the output of any other molasses furnace with less fuel consumption. The above two furnaces can be comfortably worked with only the megasse obtained from the crushed cane, if it be properly dried out. No extra fuel will be necessary .. .. [illegible]/-
5. Two Peterson's Improved K.B.type 18" x 12" Centrifugal. 1750/-
6. One Peterson's small size improved K.B.type Pugmill. This pugmill has capacity of 2 to 3 large and expensive imported pugmills and has been so designed as to best suit the work to be done in rab which has to be dealt with. It is practically continuous and when its capacity and price be [illegible], is very economical .. 450/-

Total. [illegible]/-

	D.F	B. 7850/-
7.	One Peterson's Improved K.B.type MEDIUM size Grainer's machine. This machine has been designed to go easy with hard materials and grading, it does the work very expeditiously, thoroughly and very quickly. ..	508/-
8.	One 3.H.P. 1.1" x 1.½" Belt Pulley Gear for Pumping water from tube-well, with foot and hose pulleys	835/-
9.	Two inch tubewell, tank, socks & Piping	600/-
10.	Foundation for above machinery in brick work or concrete in lime, finished of in cement plaster and in the case of engine, only top portion in cement concrete. All M.B.bolts to be grouted in with cement ..	225/-
11.	Masonry setting for the above Pan furnaces	275/-
12.	58' of 2" shafting	100/-
13.	Six cold lifting plummer blocks ..	30/-
14.	Six cold steel brackets	84/-
15.	Eight collars and [illegible] for shafting..	10/-
16.	Pulleys on shafting to drive the different machine	250/-
17.	Two sets of 2" Couplings for coupling up shafting with key and bolts ..	40/-
18.	Belting, fasteners and belt dressing etc. to prevent belt slip	10[illegible]/-
19.	Cane scoop, beam and weights	100/-
20.	Steel factory and pan furnace buildings, including foundation bolts	7200/-
21.	Concrete and masonry in foundation and plinth and multi floor factory and furnace building.	500/-
22.	Masonry work for first and second pan ..	1000/-
23.	Masonry work for [illegible] ..	125/-
24.	Freight and [illegible]	500/-
25.	Carting handling of all steelwork etc., and assembly and erection of machinery, approx.	500/-
26.	Miscellaneous, such as, levels, clocks, locks buckets, empty drums and office furniture ..	250/-
27.	Furnace tools for fireplacements, rab buckets, sugar trays, sugar screens etc.	200/-
28.	Steel sugar [illegible] platform so designed as to be used [illegible] in case of emergency	250/-
29.	Centrifugals	321/-
		14,750/-

RUPEES FOURTEEN THOUSAND SEVEN HUNDRED AND FIFTY.ONLY.

Expenditure and income statement showing per mensem on the working of a ten ton Open Pan Sugar Factory of the Bengal agricultural Department's design.

Staff			
One Manager on ;.60/- per mensem ..	60	0	0
One clerk on Rs.20/- per mensem ..	20	0	0
One cane weighment Clerk onRs.20/- per mensem	20	0	0
One cane organiser on Rs.20/- per mensem	20	0	0
One Engine Driver @ Re.1/- p. day, for 30 days or one month	30	0	0
Cane Mill.			
One man in charge on Rs.25/- per month ..	25	0	0
Five coolies at as.5 p. day per month ..	46	14	0
Rab Furnace:			
One man in charge @ Rs.25/- per month ..	25	0	0
Eight coolies @ as.5 each per shaft two such shafts, per month ..	150	0	0
Centrifugal.			
One man in charge on Rs.25/- per mensem ..	25	0	0
One coolie @ as.5 per day, per month ..	9	6	0
Pugmill.			
Two coolie @ as.5 per day, per month ..	18	12	0
Grainer & Aereator.			
One coolie @ as.5 per day, per month ..	9	6	0
Manufacture of Chakigur.			
Five coolies manufacturing chakigur @ as.5 each per day per month	46	14	0
Sugar drying and bagging.			
Three coolies @ as.5 per day per month ..	28	2	0
Watch and Ward.			
Two chowkidars @ as.5 per day per month ..	18	12	0
Fuel oil for Engine.			
Ten gallons per day @ as.7 per gallon, ie., Rs.4-6-0 per day, per month ..	131	4	0
Lubricating oil for Engine.			
Half gallon per day @ as.7 per gallon, i.e., Re.1/- per day, per month ..	30	0	0
Lubricating oil, Castor oil.			
For shafting and other machines @ 1/- per day per month	30	0	0
Grease.			
@ Rs.0-8-0 per day, per month	15	0	0
Miscellaneous. @ Rs.0-8-0 per day, per month ..	15	0	0
Repairs and Renewals @ as.8 per day, per month ..	15	0	0
Kerosin oil @ as.12/- per day per month for lighting	22	8	0
Stationery @ as.6/- per day, per month ..	11	4	0
Contingencies @ as.8 per day, per month	15	0	0
Two maund Gunny bags, 9.1/4 bags for 18.1/2 maunds sugar per day @ as.4 per bag, i.e. 2/5/- p.day p.month	69	6	0
Sugarcane three hundred maunds of sugarcane @ as.4 p.md. i.e. Rs.75/- per day p.m.	2250	0	0
	3157	8	0

A. Total expenditure per month .. Rs.3,157 8 0

B. Manufacture 1260 maunds of Rab.

C. Recover 42% first sugar from above rab i.e., 529 maunds.

D. Manufacture 50% of the balance 58% of Molasses from the Rab into chakigur 365 maunds chakigur.

The weight of rab is based on 7 maunds of good Co.213 cane to make a maund of rab.

---

1. Depreciation on machinery, steel buildings and masonry Rs.14819/- @ 5% to be recovered in four months or 120 days which constitutes one sugar season p.740-15-0 per month ..	185	4	0
2. Depreciation on miscellaneous items Rs.450/- @ 10% under same conditions, Rs.45/- p.month ..	11	4	0
3. Interest on Capital Rs.16,750/- at 10% on same conditions as before Rs.1675/- per month ..	418	12	0
4. Sugar Tax on 529 maunds of sugar manufactured in one month @ as.10 per maund, per month	330	10	0
Grand total of expenditure per month	945	10	0

3,157-8-0 plus 945-10-0 .. Rs.4,103-2-0

---

529 maunds of sugar at a minimum price of as.8/- per maund	4,232	0	0
365 maunds of chakigur at a minimum price of as.2-4-0 per maund	821	4	0
Total earnings per month ..	5,053	4	0
Total expenditure per month .	4,103	2	0
Total profits per month ..	950	2	0
Total profits per season ..	Rs. 3,[illegible]	0	0

The above profits can only be made if the management and organisation is perfectly sound, if only good and ripe plant cane of Co.213 variety is crushed, if the factory crishes to its full capacity of 300 maunds per day and 120 days in the season and does not mess up the boilings.

It is very possible that the first season, little or no profits will be made, because good and ripe canes may not be available, because the full capacity of cane per day may not be obtainable and because the cane for 120 days may also may not

not be obtainable and because the labour all being inexperienced will not be efficient and will not work the machinery efficiently and will also cause damage and breakages to the machinery, the repair and renewal costs of which may be much heavier than estimated for due to these breakages, money will be lost in stoppages to the Factory. The second season there will be a considerable improvement in the working and better profits. The third season should prove perfectly satisfactory provided there has been no slackness in the management and organisation.

In this estimate of expenditure, every item has been allowed for on a liberal scale, it is possible to reduce costs in actual working.

In the estimate of earnings the figures for sale of produce has been kept at the minimum, for instance the price of first sugar has been shown at Rs.8/-per maund, but considering the excellent quality of sugar manufactured in these plants which is superior to any other sugar manufactured by the Open Pan system, it would be quite easy to obtain Rs.9/- per maund. Similarly with Chakigur, the price of this has been entered at Rs.2-4-0 per maund but there are factories of this type which are selling their chakigur at Rs.4-8-0 and Rs.4-12-0 per maund.

People erecting this type of factory receive every help from the agricultural Engineer, Bengal and the Bengal Agricultural Department, during construction and also during working of the factory and a few experienced hands on moderate salaries can be provided by the Department to work the factory the first season and teach the local labour.

TRR.
19/9/35.

"COPY"

Summary of the results obtained from experiment on the preparation of white sugar by the open pan system at Singanallur in the Coimbatore District.

White sugar is already manufactured in India to the extent of 200,000 tons per annum by indigenous methods with or without the use of centrifugals, but principally by what is known as the "bel process" which will be described later and consists essentially of crushing the canes in small mills driven by bullocks or oil engines, evaporating the sugar and molasses in hand or power driven centrifugals. In the Madras Presidency, there are several areas under sugarcane cultivation which, although insufficient in extent to support a sugar factory, would permit of the adoption of the alternative method of manufacturing sugar on a small scale on the "bel system" particularly as the necessary plant for handling a crushing capacity of about 50 canes would cost only about Rs.5,000 which is within the reach of a village capitalist. With the object of demonstrating the manufacture of white sugar by the open pan system with the aid of centrifugals in preference to utilising the cane for the preparation of jaggery, the Department of Industries recently conducted experiments, in conjunction with the District Agricultural Association at Singanallur in the Coimbatore District, and the results, which are fully set out in the report that follows and will be tested by further trials under field conditions, are satisfying and indicate that this method of preparing sugar has considerable potentialities under the conditions prevailing in the Madras Presidency.

2. A brief description of the method employed in the preparation of white sugar by the "bel process" at Singanallur is given below. The canes after cutting are crushed in mill (bullock, or oil or gas engine driven mills can be used) and the juice extracted. The extracted juice is immediately transferred to the pans and boiled over a furnace. The

bagasse that is left is collected, dried and used, along with the trash as fuel for the furnace. The juice, after concentration to the setting point-it is then known as rab--is stored in mud pots or old empty kerosine tins for a week so as to enable it to crystallise freely, after which it is centrifuged in a high speed centrifugal machine and the sugar and molasses separated. The sugar is then dried and stored. The molasses expelled from the centrifugal machine are then either reboiled and converted into second quality sugar or boiled with a small proportion of fresh cane juice and converted into jaggery for which there is always a local demand.

3. The machinery and plant required for the purpose are:

1. One oil or gas engine 12-14-H.P.
2. One sugar cane crushing mill
3. One set of 5 pans (for first rab)
4. One set of 2 pans (for second rab)
5. One centrifuge.
6. Buckets, spoons, pans, mugpots or empty kerosine tins, etc.,

Suitable sugar cane crushing mills can be obtained from Messrs. Massey & Co. Ltd. Madras, Messrs. Volkart Brothers, Madras or the F.C.M. and Sons Charity Industrial Institute, Peelamedu, Coimbatore; Centrifugals from Messrs. Mory Brothers, 15, Clive Street, Calcutta, and Messrs. Massey and Co. Ltd., Madras. Pans and furnaces can be obtained from the Government Industrial Schools at Bellary or Calicut. Drawings of these can be obtained on request from the Director of Industries, Chepauk, Madras.

4. <u>Crushing.</u> The canes, after cutting, are carried to the crushing mill and crushed. Two workmen are required to work the crusher, one to feed the canes and the other to remove the bagasse, besides coolies for carrying the cut canes to the crusher. A McCormick Deering Chattanooga Sugar Cane Crushing mill (Volkart Bros) with two rollers was used. This crushed about 1.2 tons per hour and the crusher had therefore

to be worked for 2 hours for crushing 2½ tons of canes (yielding the quantity of cane to separate which the centrifuge has to be worked for 7 hours). The cost of crushing in a power crusher is cheaper than crushing by the country method as can be seen from the figures given under:

<u>In the case.</u>

Cutting canes and carrying	Rs.5	10	0
Working the crusher for 8 hours @ Rs.8-12-0 per day of 10 hours ..	Rs.2	10	0
	5	4	0
Cost of crushing 1 ton of cane ..	1	8	0
Cost of crushing 4168.7 lbs. cane	2	12	0

The cost of crushing 4168.7 lbs. cane (canes yielding 600 lbs. of jaggery, allowing that the yield of jaggery is 12% of canes) varies from Rs.2-12-0 to Rs.3-8-0 in the different districts (as supplied by the Department of Agriculture), the average being Rs.3-0-0. The cost of crushing the same quantity of canes with the large power crusher comes to about Rs.3/- . Besides there is saving in time. The average yield of juice per 100 lbs. of canes--crushed by the power crusher--is about 60 lbs.

(5) <u>Boiling of the juice.</u> The juice is usually removed at once to the pans. The average Brix (the total solids dissolved in the liquid) was 17.86. The bel (boiling hole I) consisted of 5 iron pans with the following dimensions:-

		Diam.	Depth.
Pan No.1	..	7'-5"	2'-4"
Pan No.2	..	6'-10"	22"
Pan No.3	..	5'-8"	20"
Pan No.4	..	4'-9"	10½"
Pan No.5	..	3'-3"	8½"

The juice is put into the pans, starting from the 5th and after the pans are charged with the juice, fire is lit and feeding of the furnace with dry bagasse is continued regularly to maintain an intense fire. Care must be however taken to begin the boiling quickly, so as to avoid fermentation

setting in. The scum soon rises on the surface and hissing sound is heard, when the clarifying agent is added. This is prepared by pounding about 1¾ lbs. of green stems of Hibiscus Esculantus (Lady's finger--Benda) in 24 lbs. of water in a mud pot. The stems are rubbed between two hands when a mucilagineus liquid is obtained. This is taken out of the pot.with a spoon and added to the juice in the pan first, scum, rather dark green in colour comes up to the surface and this is followed by white froth if the clarification is finished. The addition of the clarifying agent is, therefore, continued until the ~~forth~~ froth is white. The scum formed is removed with a round perforated iron disc rivetted to a handle, and then thrown with it on to a cloth placed on a wicker basket to serve as a filter. During boiling scum to about 2% on cane and 1.2% on juice is usually obtained. The sucrose content of the scum was found to be 8.7%. When all the scum has been removed, a solution of sajji--alkaline earth, is poured into the boiling liquid. The sajji has the following composition:

			%
Moisture	..	..	32.53
$Ca\ CO_3$	..	..	0.25
$Mg.Co_3$	..	..	0.033
Na_2Co_3	..	..	33.59
$NaHCO_3$	..	.	22.36
Na Cl.	..	..	4.74
$Na_2\ So_4$	..	..	3.79
Insoluble in water		..	2.48
			99.773

About 8 ozs of sajji is dissolved in 14 lbs. of water. On the addition of sajji, with the evolution of CO_2 there is abundance of froth and a mild bleaching action on the liquid is also observed. As the juice in the 5th pan gets less, the juice from the 4th -- the one above--is added and so on. As soon as the temperature in the last (5th) pan comes to

111° (temperature of settling), it is removed very quickly from the pan into the pots placed very near, where it is cooled to very nearly the room temperature and then put in mud pots or empty kerosine tins. As soon as the fifth pan is emptied it should at once be filled up with juice from the one above (4th); else the small quantity of juice in the 5th pan will be charred, which is not desirable. There is considerable frothing in the last 3 pans and if this becomes so violent as to entail risk of overflowing, an aqueous extract of crushed castor seeds, is sprinkled over the surface, when the froth subsides immediately. The juice gets more and more concentrated from Pan III to V. The average quantity of juices boiled per hour is 9 mds. Other materials Viz., Alkaline earth from the Central Far, Coimbatore, and soda ash were also used instead of sajji. The sugar in both the cases was not inferior to the one produced usually. The average yield of Rab from 100 lbs of cane and juice was found to be 12.5 lbs. and 19.4 lbs respectively. On boiler (on about Rs.15/- per month) and two coolies will be required for boiling the juice.

6. Centrifuging the Rab. The Rab is kept for about a week after setting and then centrifuged. The centrifuge used was the Bery's 18" diam. belt power, geared type machine, employing belt for the cage spindle. The rab is usually potted in earthen pots. These have to be broken to take the rab out for centrifuging. Before putting into the centrifuge the Rab is well powdered, then put in the centrifuge which is then started. About 50 lbs. of rab is put each time and worked for about 20 minutes. When the white sugar and molasses separate out, the white sugar is washed with water--not more than once--then taken out and dried in the sun. There is a loss of moisture when dried to about 2.3%. The centrifuge is now filled with a second charge of rab and the process repeated as before. This is repeated for 7 hours; 7 hours working is sufficient for centrifuging rab from 3½ tons of canes crushed per day.

Four women are required for [illegible] the rab and two men for [illegible] the centrifuge. The cost of centrifuging rab from [illegible] of cane is Rs.[illegible]-7. The average yields of sugar in [illegible] of cane, rab and molasses i.e. 4.5, 6.9 and 37.4% respectively.

7. Jaggery from Molasses. Jaggery prepared from molasses absorbs moisture very easily and quickly and does not remain dry and so such jaggery purchased cannot be kept long in sound marketable condition.

Molasses and fresh cane juice were boiled up the country way by the country method, the water having been added and the scum removed. Different proportions of molasses and cane juice were used. The best proportion seems to be cane juice: Molasses:: 3:1 (or 1 of the bulk the weight of molasses). This jaggery was sold at Coimbatore for the same price for which jaggery from cane juice only was sold.

8. Detailing of Sugars. The methods for sugar detailed in Method II. The yields are shown in the [illegible] of c Molasses and the sugars are very heavy. Conversion of molasses into sugar by [illegible] the cane juice is more efficient than detailing the molasses into sugar II and getting sugar II from it. Price of sugar from 100 lbs. of molasses by detailing it Rs.[illegible]. Compare the price of jaggery obtained from 100 lbs. of molasses by boiling it with cane juice i.e. Rs.[illegible].

[illegible] of detailed results of [illegible].

I. Density.

(a) Cane	..	..	71710.9 lbs.
(b) Filter	..	..	[illegible] "
(c) Rab	..	..	8956.1 "
(d) Sugar	..	..	2387.6 "
(e) Molasses	..	..	5531.[illegible] "

II. Yields per 100 lbs.

(a) Filter	..	..	[illegible]
(b) Rab	..	..	12.5
(c) Sugar	..	..	4.7
(d) Molasses	..	..	7.[illegible]

Telegraphic address:—"INDUSCOM."

GOVERNMENT OF MYSORE.

DEPARTMENT OF INDUSTRIES AND COMMERCE.

In reply please refer to
No. D.5-6/35-36.
Encl. One

OFFICE OF THE DIRECTOR,

Dated Bangalore, ... 29th May 1936.

5797

2 JUNE 1936
DEVELOPMENT BRANCH

FROM

S. Abdul Wajid, Esq.,B.A.,
Director of Industries and Commerce in Mysore,
Bangalore (India).

To

M. Venkatanaranappa, Esq.,B.A.,
Secretary to the Government of Mysore,
Development Department, Bangalore.

SIR,

New type of sugar factories requiring a capital of Rs 20,000/-.

In continuation of my letter of even number dated 24th October 1935 on the above subject, I have the honour to state that the Agricultural Engineer to the Government of Bengal was addressed to furnish me with the details re. the working of the above plants. I enclose herein for the information of Government copies of letters Nos.646 and 2327 dated 27th July 1935 and 26th March 1936 respectively received from him.

Mr. Peterson's figures show a profit of about Rs 3,800/- on investment of Rs 20,000/- which works out to 19 per cent after providing for depreciation, interest and other charges. He states that no reliable data can be obtained from any private concern or concerns working under this system. He claims that a total of 6¼ per cent of sugar and 5 per cent of gur can be obtained from this process and there will be no waste in molasses.

The plant and machinery required contain a number of units and it is not known how each works in actual practice. No plan and description of the plant or the factory is given and we are not in possession of details of working. I therefore consider it necessary to depute a technical Officer to watch the working of the machinery and collect particulars of working and other details during the next season before coming to any decision.

I request you to kindly obtain sanction of Government for the deputation of an Officer for this purpose. I shall submit details on hearing from you.

I have the honour to be,
Sir,
Your most obedient servant,

Director.

usc)

Letter No. 646 dated 27th July 1935 from the Agricultural Engineer to the Government of Bengal, Dacca to the Director of Industries and Commerce in Mysore, Bangalore.

With reference to your letter No. I.S. 6/35-36 dated the 5th July 1935 addressed to the Director of Industries, Bengal, on the above subject, and which has been forwarded to me for reply, I have the honour to state:

Midnapore	District	-	One
Murshidabad	"	-	One
Rajshahi	"	-	Three
Malda	"	-	One
Rangpur	"	-	One
Dacca	"	-	Two
Mymensingh	"	-	Two
Nadia	"	-	One
Jalapaiguri	"	-	Two
Nepal		-	One

Besides the above complete factories of the older and latest types, a very large number of improved machines of department -al type for the manufacture of sugar have been installed in several parts of Bengal and in other Provinces.

I expect several complete factories of our latest improved type to be erected for the coming cane season all over India.

There are none of these factories actually owned by educated youngmen but these factories help to reduce unemploy -ment among educated young men by employing them to work some of the machines, weighing cane, correspondence, organising cane supply, etc.etc.

The initial and working costs are given in detail in the two estimates enclosed which also show financial results.

Letter No. 2327 dated 26th March 1936 from the Agricultural Engineer to the Government of Bengal, Dacca to the Director of Industries and Commerce in Mysore,Bangalore.

With reference to your letter No. D.5-6/35-36 dated 19th March 1936 and signed by the Industrial Engineer, I have the honour to state as follows.

The process of manufacture in these plants has been changed from time to time in order toarrive at the best results and it is due to this, that the figures mentioned by me in the different documents sent you do not all tally. In your figures which are wrong, I might state, that the volume of molasses decreases when reboiled into gur and this has not been taken into consideration in your calculations. I have found the quality of the same variety of cane differs in the different districts of Bengal, due to soil and climatic variations, in some districts the sugar contents is very high and in others not so. It is also a very difficult matter to obtain.correct figures from privately owned factories and figures which can be relied on are only obtainable when I personally or an experienced member of my staff can spare the time to spend several days at these factories and record the figures ourselves.

This season the above practice has been followed and the <u>average figures</u> given below can be relied on.

a) From 100 maunds of cane 13 maunds of rab is obtained in

some cases 14 to 15 where the cane is rich.

b) From 13 maunds of rab 6½ maunds of sugar is obtained in one recovery only i.e. 50 per cent of rab or 6½ per cent of cane.

c) The balance of 6½ maunds, which is first molasses, is converted into gur. From which 6½ maunds of molasses 5 maunds of gur is manufactured - 5 per cent of cane.

A total of 6½ per cent sugar and 5 per cent gur = 11½ per cent of cane.

In this process you will see there is no waste molasses whatever, which, practically has no value. In the large Vacuum Pan factories in Bengal crushing the same quality of cane as is crushed in our Open Pan factories, the total recovery of sugar from three recoveries is from 7.5 per cent to 8.5 per cent of cane only, plus a large quantity of waste molasses which is difficult to get rid of at any price.

I am continuing my experiments with a view to obtaining in two recoveries 8 per cent to 8.5 per cent sugar, equalling the Vacuum Pan efficiency, but in this event we will be faced with the same difficulty of waste molasses and its disposal.

I am sending you per post a small sample of chakigur which is hard gur cast in the form of a brick or block. The advantage of a hard gur is its keeping qualities in a moist climate, it is also preferred in Bengal to a soft or watery gur for consumption and can be sewn up into gunny for trans-port.

" C o p i e s "

Director.

Usc)

39

Appendix F G—1]

SUBJECT.....

.....

.....

Section A & E

File No.

Serial No.

Diary No. of letter replied to.....

No. D. 582-G 22/7/36

To

The Dir. of Ind. &c.

Sir, with ref. to your letter No. D.5-6/35-36 d 29/5/36 requesting sanction to the deputation of an officer to study the working of New Type Sugar Factories requiring a capital of Rs 2,000, I am directed to request you to submit detailed proposals for deputing an officer of the Dept to study the working of a factory of the type advocated by the Agri. Engr, Bengal.

General and Revenue Secretariat

( )

the 193 .

Date of issue 22-7-36

Signed by N.V. Rao

List of enclosures.....

Copied by .....

Examined by.....

WD 03601—GPB—30,000—23-9-35

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE

General and Revenue Secretariat

No. D-582

Dated, Bangalore, 20th July *193* 6

From

The *Secretary to the Government of His Highness the Maharaja of Mysore, Development Department.*

To

The Director of Industries and Commerce in Mysore, Bangalore.

Sir,

With reference to your letter No. D.5-6/35-36 dated 29th May 1936 requesting sanction to the deputation of an officer to study the working of New Type Sugar Factories requiring a capital of Rs. 20,000/- I am directed to request you to submit detailed proposals for deputing an Officer of the Department to study the working of a factory of the type advocated by the Agricultural Engineer, Bengal.

I am to enquire if the factory at Singanellur in the Coimbatore District is not an experimental plant and whether any factories of this type have been successfully established on a commercial basis. If there are any such which may be worth visiting, the Officer to be deputed may see these factories also.

It is understood that there is a factory in Bagepalli working on the Coimbatore model. Full information regarding the working of this factory may also be furnished for the information of Government.

I have the honor to be,
Sir,
Your most obedient servant,

for Secretary to Government,
Development Department.

Als.2.

No. 46.

4th August 1936

Dear Mr. Ananthasubramanyam,

Please refer to your letter No.238 of the 10th October 1935 enclosing a copy of the Agricultural Engineer to the Government of Bengal regarding the new type of sugar factory that is being introduced by the Department of Agriculture in that Province. I shall be glad if you will kindly check over the figures relating to cost of production, earnings, etc. Kindly meet me tomorrow between 3 and 4 P.M. and let me know whether the figures may be taken as being approximately correct in the present ~~circumstances~~ circumstances.

Yours sincerely,

MM

R. Ananthasubramanyam, Esq., B.A., B.L.,
Secretary, Mysore Sugar Co., Ltd.,
Seshadri Road, Bangalore.

No. A4.P. 14/36-37
Encs: two & 1 book.

OFFICE OF THE DEPUTY COMMISSIONER,
SHIMOGA DISTRICT.

Dated Shimoga, ...August..9.....*193* 6 .

704

Dear Sir,

I enclose herein, for favour of your kind perusal, a copy of the letter No. 980/2 dated 5-8-1936 from the Senior Assistant Director of Agriculture, Shimoga, with its enclosure and the Pamphlet relating to "White Sugar by open pan process", received from him.

Yours sincerely,

N. Madhava Rau, Esq., B.A., B.L.,
Second Member of Council, BANGALORE.

Letter No. 980/2 dated 5th August 1936 from the Senior Assistant Director of Agriculture, Shimoga to the Deputy Commissioner, Shimoga District.

**

With reference to the desire expressed by the Second Member when he was here last, I have the honour to enclose a copy of the letter received from Hyderabad. I am also sending you the pamphlet sent to me. This contains a good deal of information.

So far as the ripening of the local cane is concerned, the Agricultural Chemist must be in a position to give accurate figures. However, I am asking for a field refractoneter (Sacharineter) and If I get it, I shall be able to gather some data during the next few months.

""""

Copy

S. Narayana Rao

Deputy Commissioner,
Shimoga District.

9/8

D.C. No. 7335 dated 26-10-1345 from the Deputy Director of Agriculture G.Cauvari Division, Karpbani to Mr. Gundappa S. Kurpad, B.A., Senior Assistant Director of Agriculture, Shimoga.

" received your D.C. duly in which you have asked me to give the data that was collected about the Gulfactory that was worked a few years ago at Esuiwadgaon a place in this Division. After receipt of your D.C. I searched out the records in the office, from which I could ascertain that the sugar making was never attempted at Esuiwadgaon on a large scale of Factory. A Rug-mill and a Centrifugal pump was obtained from Messrs. Kirloskar Bros. and the Sugar making was only demonstrated on a few occasions to the people round about Esuiwadgaon. This being the case no figures about the turn out of work and the expenditure could be traced out. I am therefore sorry for my inability to supply the needed information and my opinion based on the perusal of the data if it could be available."

" C o p y "

Senior Assistant Director.

No. 53

Issued on
10th August 1936

Dear Mr. Narayana Rao,

I am in receipt of your letter No.A4.P.14/36-37 dated the 9th August 1936 forwarding a copy of the pamphlet issued by Messrs. Kirlosker Brothers Ltd. on white sugar by open pan process. I trust Mr. Kurupad will be able to gather ~~accurate~~ some useful information regarding ripening of local canes.

Yours sincerely,

Sd/ N.M.

S. Narayana Rao, Esq., M.A.,
Deputy Commissioner, Shimoga.

memo. 53-1

Copy of the above with the pamphlet referred to is forwarded with compliments to the Development Secretary.

NM

KA.
18.8.36

No. A4.C. 360-14/36-37.
Enc: 2 with photostats

OFFICE OF THE DEPUTY COMMISSIONER,
SHIMOGA DISTRICT.

17 AUG 1936

Dated Shimoga, August 16, 1936.

Dear Sir,

With reference to your D.O. letter No. 53 dated 16th August 1936, I write to state that the Senior Assistant Director of Agriculture, Shimoga who was informed of the contents of your letter in regard to the ri ening of canes in the Bhadravathi Channel area both under the Nala and under the tanks, has replied that the necessary trials will be started in November 1936 and continued till March 1937 and that he has indented for a Refractometer. I enclose herewith, for favour of information, a copy of the Note from the Book sent by him regarding the manufacture of 'Khandsari Sugar' by the single pan method as also two Photographs taken during your visit to the Colemanpet Colony.

Yours sincerely,

SECOND MEMBER'S OFFICE
17 AUG 1936
No. 1187

N. Madhava Rau, Esq., B.A., B.L.,
Second Member of Council, Bangalore.

Serial No.

Dft acknowledging Subd.

HHb 20/8/36 by

Issue by 20.8.36

Issued No. D. 1412-5 d 21/8/36

Resubd after issue.

HHb 21/8/36 by

1575 21/8

25 AUG. 1936

NOTE—Contn. Sheet.

A PRELIMINARY NOTE
on the

STATUS [illegible]
of

[illegible] 'MALAMBO' SOUTH.

****

By

D.R. Sebik, B.A.S., Director of Agriculture, Niger and Orisons.,

[illegible], B.Sc., Assistant Director of Agriculture, In charge, South [illegible] Range.

***

A PRELIMINARY NOTE

A PRELIMINARY NOTE
on the
SINGLE PAN METHOD
of
MANUFACTURING 'KHANDSARI'
SUGAR.

**

BY

A PRELIMINARY NOTE ON THE SINGLE PAN METHOD OF MANUFACTURING "KHANDSARI" SUGAR.

***

By: D.R. Sethi, I.A.S., Director of Agriculture, Bihar and Orissa., and

B.N. Sarkar, L.Ag., Assistant Director of Agriculture, In charge, South Bihar Range.

The protective tariff on sugar and the prevailing low price of gur have given an impetus to the "open pan" method of sugar manufacture using either the Rohilkhand bel or the Bhopal bel. No detailed description of these two "bels" is necessary here as they have been fully described and discussed by Srivastava in "Scientific monograph No. 3 of the Imperial Council of Agricultural Research". The Bhopal bel was worked at the Patna Farm in the cold weather of 1931-32 and although it worked fairly satisfactorily, certain defects and limitations were noticed with regard to its introduction in South Bihar where small holders predominate. The most important of these are:--

(1) A standard Bhopal bel does not lend itself to any material alteration and as such requires capital and organisation beyond the means of an average cultivator in South Bihar.

(2) Extra fuel is always necessary but fuel is not easily available to cultivators.

(3) The use of the various clarifying agents, at different stages in the process of boiling makes the whole process so complicated that very skilled, trained men are required if satisfactory results are to be achieved. These clarifying ingredients are also difficult to obtain in large quantities in the villages.

(4) On theoretical grounds the furnace leaves much to be desired with regard to its evaporating capacity because the ratio $\frac{\text{Juice capacity of the pan}}{\text{Heating surface of the pan}}$ is as high as 10.8 (Srivastava, loc. cit).

The

The above considerations led the writers to look for a simpler - furnace and to make an attempt to evolve, if possible, a simpler process which would enable any cultivator to make "rab" (massecuites) suitable - for being centrifuged into 'khand' (Sugar).

The main points involed in the study of this problem appear to be:-

1. For the average cultivator the furnace should preferably be a single pan furnace the design and construction of which is no more complex than the one he is accustomed to, and its cost should be within his means.

2. The clarification process should be so simple as to obviate the necessity of skilled boilers.

3. In boiling juice by the 'open pan' system inversion of sucrose appears to be a function of two factors, viz., temperature and time. It is not possible to keep the temperature below 100^0 C. and it increases with the concentration of the juice when boiling is done in open pans. But by increasing the efficiency of the furnace, it is possible to reduce the time taken for boiling a unit quantity of juice into rab, and thus to reduce the amount of sucrose lost.

Of the various types of country furnaces in use the one used for making "Shakkar" in some parts of the Punjab appeared to possess distinct possibilities. This simple furnace provided the basis of these preliminary investigations and the indications are that it is possible to manufacture white sugar in a much simpler way by the use of a single pan.

<u>Equipment</u>:-- The equipment for this experiment consisted of.--

1. A Massey cane crusher.- This was a four-year old crusher with 14-in. rollers. Capacity about 20 mds. per hour.
2. S.B. Furnaces with pans and accessories (plate XXIX). A temporary shed was put up to shelter these furnaces from sun and rain.

3. One 18 in. Bery's power-driven contrifugal machine.
4. Kerosine oil tins, earthen pots, etc.

Crushing:-- Crushing was usually done in the early hours of the morning and in the afternoon, so that a supply of fresh juice was maintained throughout. No topping of canes was done and whole canes were crushed throughout.

Description of the furnace:-- The only difference between this furnace and the ordinary country furnace is that better provision has been made for draught and a flue and chimney have been added. The extra materials required for its construction are an iron grate and about 700 sun-dried bricks. The grate is made of a circular iron sheet 4 ft. in diameter with holes in the centre. The bricks are required for the flue and the chimney. A plan and cross section for the construction of this furnace are reproduced in the accompanying Chart.

Construction:-- "A circle of 3 ft. diameter is marked on the ground where the furnace is to be constructed, and a hole is dug of the shape of an inverted bucket to a depth of 2 ft. 9 ins. from ground-level, making the inside diameter 4 ft. 6 ins. at this level. The bottom of the excavation is made flat at this level and again a circle of 3 ft. diameter is drawn as at the top. Digging is continued in the same way as before to a depth of another 3 ft. Next the air passage and feeding hole are cut out as shown in the diagram. The flue should then be dug and the chimeney built as shown. A piece of wide plank, or a few bamboos, is put over the air passage and plaster it over with mud; this forms a seat for the fire-man. It remains to build up a wall, about 3 ins. to 4 ins. high above the ground and to level around the furnace opening for placing the pan. The pan is put on and fitted properly so that it sits level and no opening is left for the smoke to escape through. The measurements of the pan are as follows.-

Top diameter 4 ft.4 ins., bottom diameter 3 ft.4ins. depth 7 ins.

Description of the process:-- An average charge of 2 mds. of

juice

juice is boiled in each pan. The pan is heated for a little while before the juice is poured into it. Within 7 or 8 minutes the juice comes to boiling point and a thick layer of scum forms on the surface which should be removed as quickly as possible. After the operation of first scumming is over, the furnace is fired rapidly and the juice boiled down to rab as quickly as possible, removing any scum that forms on the surface. The first pan takes 1 hour 15 minutes and subsequent charges takes only an hour. When the rab is ready the pan is lifted up and the rab poured into the cooling vessel fixed in the ground nearby. A rapid cooling of the rab accompanied by stirring by means of a scoop for about 5 minutes follows. The rab crystallizes in 3 or 4 hours' time.

Clarifying:-- No clarifying agent was used in these experiments. When the juice was to be kept for some time about 4 ounces of lime water for each gallon of juice was added as a preservative.

Capacity:-- In practice it was found that each furnace could deal with about 25 mds. of juice in a day of 10 hours. Four such furnaces are therefore equal to one Bhopal bel.

Chemical aspects of boiling:-- Due to want of staff it was not possible to obtain chemical data for the whole of the working season. Neither was it possible to do any systematic chemical work. Sufficient work was however done in March to obtain preliminary data with regard to efficiency of the furnace and other points in the process that may need further investigation.

The juice boiled had a sucrose content varying between 16.5 and 17.8 per cent. and its invert sugar contents were between 0.66 and 0.76 per cent. on juice, in the first week of March. The purity was 85.7. Due to high moisture content of the soil and unsuitable weather conditions, proper ripening of the cane was retarded and it was not until a fortnight later that the juice richness rose, the highest purity recorded being 88.9 It was not always possible to charge the pan with fresh juice as obtained from the mill and the juice had to be stored in tins

near

near the furnace. During this storage there was a perceptible amount of inversion, the amount of glucose rising from 0·57 to 0·76 with a corresponding fall in purity.

The rate of evaporation could be judged from the rise of Brix during the process of boiling. This was not constant as it depended not only upon the rapidity of feeding the furnace but more probably upon slight variations in constructional details of individual furnaces. Thus in one furnace (Furnace No. 1), there was invariably a higher rate of rise in Brix than in others in the same period. In this furnace on the 16th March the Brix figure rose from 20 to 30 in 30 minutes and to 41·5 in 45 minutes. On the following day a similar rate of rise was again observed from 19 to 22 and then to 28 and then again to 38·7. In the three other furnaces this rate of rise was slower e.g., in Furnace No. 2, which gave higher figures than the two others during 15 minutes intervals, the Brix rose from 20 to 22 and then to 26 and lastly to 28. It would appear therefore that Furnace 1 was more efficient than the others. The details are given in Tables I and II.

The loss of sucrose by inversion was also considerable. A reference to Tables I and II suggests that the loss was not very great during the first 45 minutes of heating when the temperature did not rise above 102° C. There was a rise of purity in the second quarter of the boiling by which time the juice became clarified. The purity began to fall in the third quarter and continued to do so in the final stages due probably to inversion. The loss by inversion was comparatively large in the last 15 minutes of the final stage of 'rab' making, when the ratio of glucose to sucrose suddenly increased and became more than double of what it was in the initial stages. The acidity did not increase in the first 15 minutes but within the second 15 minutes it rose by 25 per cent. and by 50 per cent. in the third quarter (Table III). During the last quarter of boiling, the acidity of the juice further increased perhaps due to concentration. The large amount of inversion

con

can be attributed to the high temperature (114°C.) of the boiling syrup. If the period of final concentration should by any chance be prolonged, the inversion would perhaps be still greater.

A loss in purity occurred within the first 15 minutes of boiling in all the furnaces. As no clarifying agent was added which would have raised the Brix and thus lowered the purity, this can only be accounted for by the formation of invert sugar. The purity however increased in the next 15 minutes due to the removal of scum, but fell again. The purity of rab was invariably lower than that of raw juice, sometimes by as much as 5 points. A drop in purity means less sugar recovered. Again the amount of invert sugar in the finished rab was very high. This figure varied in different boilings but sometimes exceeded 10 per cent and the ratio of glucose to sucrose which was about 4 in the raw juice rose to about 13. This therefore appears to be one of the more important sources of the loss of sugar. The decomposition of sugar resulting during the last stage of concentration owing to high temperature (114°C.) would naturally result in lowering the quality of the sugar as well. A more efficient control of final boiling combined with a practical method of checking the acidity is indicated.

CHANGES IN THE COMPOSITION OF JUICE DURING THE PROCESS OF BOILING.

Date of boiling 16th March, 1933.

Furnace 1.

Details of analysis.	Raw juice.	After 15 min. heating.	After 30 min. heating.	After 45 min. heating.	Rab.
Temperature in C°	20	101	102	102	..
Brix.	20	24.23	30.28	41.58	86.83
Sucrose.	17.77	21.22	27.24	35.74	74.60
Invert sugar.	0.76	1.14	1.36	2.13	8.54
Glucose Ratio.	4.28	5.37	5.00	5.96	11.44
Purity.	88.75	87.57	89.96	85.95	85.91

Furnace 2.

TABLE I - Contd.

Furnace 2.

Details of analysis.	Raw juice.	After 15 min. heating.	After 30 min. heating.	After 45 min. heating.	Rab.
Temperature.	20	101	The bottle containing the hot juice broke.	102	..
Brix.	20	20.92	..	30.75	..
Sucrose.	17.78	18.35	..	26.68	..
Invert sugar.	0.76	0.76	..	1.20	..
Glucose Ratio.	4.27	4.14	..	4.49	..
Purity.	88.90	87.71	..	86.76	..

Furnace 3.

Temperature..	20	101	101	102	..
Brix.	20.1	22.12	24.27	28.55	..
Sucrose.	17.80	19.20	22.36	25.68	..
Invert sugar.	0.76	1.01	1.17	.30	..
Gloucose Ratio.	4.27	5.26	5.23	5.06	..
Purity.	88.55	86.80	92.13	89.94	..

TABLE II.

Date of boiling, 17th March 1913.

Furnace 1

Details of analysis.	Raw juice.	After 15 min. heating.	After 30 min. heating.	After 45 min. heating.	Rab.
Temperature.	27	101	102	102	..
Brix.	19.26	22.36	28.02	38.66	83.58
Sucrose..	16.56	18.38	24.94	30.26	68.60
Invert sugar.	0.66	0.96	1.20	1.71	5.92
Glucose Ratio...	3.98	5.22	4.80	5.65	8.63
Purity.	85.98	82.20	89.08	78.27	82.07

Furnace 2.

Details of analysis.	Raw juice.	After 15 min. heating.	After 30 min. heating.	After 45 min. heating.	Rab.
		Furnace 2.			
Temperature. . .	27	101	102	102	..
Brix. . . .	19.26	22.16	26.40	33.96	89.68
Sucrose.. . .	16.56	18.23	23.06	28.20	73.50
Invert Sugar. . . .	0.66	0.95	1.20	1.42	9.26
Glucose Ratio. . . .	3.98	5.21	5.20	5.03	12.59
Purity... . . .	85.98	82.96	87.34	82.94	81.95
		Furnace 3.			
Temperature . . .	27	101	101	102	..
Brix.	19.46	21.26	25.60	31.95	89.68
Sourrose. . .	16.68	17.31	22.02	26.02	72.60
Invert sugar. . .	0.66	1.08	1.36	1.52	9.26
Clucose Ratio.. .	3.95	6.23	6.17	5.84	12.75
Purity.	85.71	81.42	86.01	81.31	80.95
		Furnace 4.			
Temperature. .. .	27	100	101	102	..
Brix..	19.06	21.36	25.20	31.95	89.68
Sucrose.. .. .	16.30	17.88	21.92	26.98	71.20
Invert sugar. . .	0.67	0.86	1.16	1.32	6.99
Glucose Ratio.. .	4.11	4.81	5.29	4.90	9.81
Purity. . . .	85.52	83.70	86.98	84.31	79.39

TABLE III.

Change of acidity of juice during boiling.

Date of boiling 16th March 1933.

	Raw juice.	After 15 min. heating.	After 30 min. heating.	After 45 min. heating.
1st Furnace. ...	30	28	40	52
2nd Furnace. ..	30	28	..	35
3rd Furnace. ..	30	29	33	31
Date of boiling 16th March 1933..				
1st Furnace.	27.5	27.5	33	40
2nd Furnace.	27.5	27.5	35	40
3rd Furnace.	30	26.5	33	43
4th Furnace.	31	22.5	32	42

The products of boiling.

In Table IV is given the composition of the raw juice and the products of boiling. Analysis figures for Rab II, Molasses II and Sugar II have been omitted as the data is not sufficient to justify their inclusion.

(a) First Rab.- The quality of the first rab from each boiling necessarily varied in the absence of any standard to decide when the finished product was ready to be removed from the fire. Composite samples were taken from a whole day's boiling for analysis. The amount of sucrose was found to vary from 68.5 to 77.4 per cent. while the purity varied from 76.8 to 86. It has already been noted that the largest amount of inversion took place during the last stage of concentration and unless the boiling was efficient some caramelisation of sugar must have taken place owing to the high temperature. This coupled with the decomposition of invert sugar would account to a certain extent for the colour of the sugar which was of a pale yellow colour.

The average Brix of the rab made was 88.62 and its average purity 82.23 as against 85.77 the average purity of juice. The percentages of sucrose and invert sugar were respectively 72.70 and 8.88. These figures compare favourably with those obtained in the Bilari experiments from the multiple-pan Bhopal or Rohilkhand bels.

The yield of 1st rab on 100 juice with a Brix of 19.15 should have been not less than 20 whereas it was only 17.53 although its Brix was 88.62. This low yield is to a large extent due to loss of syrup owing to inefficient scumming. It is also to a small extent due to minute inaccuracies in weighing on different weighing ~~on different weighing~~ appliances. Losses through these sources are preventable and steps are being taken to control these more efficiently.

(b) First sugar.- The average of 1st Sugar recovered works out at 5.17 per cent. on cane, 8.28 per cent. on juice and 47.14 per cent. on 1st rab. Calculated on rab the recovery would appear to be quite satisfactory

The

The percentage recovery on cane or juice would have been better if the preventable losses due to inefficient skimming had been detected earlier in the season. The sugar recovered gave on analysis an average of 92.7 per cent. of sucrose and an average of 2.75 per cent. of adherent invert sugar. That the quality of the sugar could have been very considerably improved by proper washing in the centrifugal machine without very much affecting the total recovery of first-sugar, was evident from the fact that one sample that was properly washed yielded an excellent sample of sugar which contained only 0.87 per cent. of invert sugar. Only plain warm water without any bleaching agents, such as stannous chloride or sodium hydrosulphite, was used in washing this sample. These results clearly indicate that the unpretentious S.B. Furnace can be relied upon to do at least as efficient work as the more elaborate multiple-pan furnace at actually a much lower initial cost and reduced working expenses.

(c) First Molasses.- The first molasses, which included the water used in cleaning the centrifugal machine formed 45.32 per cent. of the 1st rab. Their Brix was 72 and the sucrose content and invert sugar were 46.9 and 13.19 per cent. respectively. These figures indicate that these molasses were richer than those obtained in the Bilari experiments. Apparently the percentage of fine crystals which the centrifugal machine allowed to pass with the mother liquor was much greater in this rab than in that made during the tests at Belari. This is attributable partly to the much shorter period - 4 days - allowed for crystallization than was the case in the Belari experiments where a full week was allowed before curing was undertaken.

TABLE IV.

Showing the composition of the raw juice and the products of boiling.

-	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
Juice.							
Brix. . . .	19.63	20.02	19.86	18.60	18.80	18.12	19.01
Sucrose.. . .	16.50	17.20	17.76	15.78	15.89	15.68	16002
Clucose.. . .	0.57	0.54	0.61	0.77	1.03	0.80	0.86
Purity. . . .	84.05	85.91	89.42	84.83	84.52	86.53	84.27

Rab I

TABLE IV (contd).

-------	1st day	2nd day	3rd day	4th day	5th day	6th day	7th day
Rab I.							
Brix. . .	87.80	89.18	88.80	88.00	87.76	90.18	94.64
Sucrose. .	73.49	68.50	75.50	70.70	70.60	77.40	77.90
Invert sugar.	7.69	8.00	8.30	10.70	10.40	8.19	8.36
Purity.. .	83.70	76.81	85.02	80.34	80.44	85.82	84.42
Sugar I.							
Sucrose. .	92.40	91.60	92.60	93.14	94.03	93.50	91.72
Invert sugar.	2.15	3.66	3.00	2.48	2.40	4.05	4.61
Molasses I.							
Brix. . .	72.53	66.26	70.33	69.42	71.88	73.60	75.24
Sucrose. .	47.33	43.04	45.42	44.66	44.10	42.90	47.00
Invert sugar.	12.80	13.84	13.20	12.81	13.30	24.04	17.48
Purity.. .	65.25	64.98	64.58	64.33	61.33	58.28	62.46

CONCLUSION.

These preliminary trials indicate that it is possible to make 'Khandsari' sugar by means of a single pan furnace. The data obtained clearly indicate that with a little more attention to detail the single pan furnace is likely to give equally as good if not better results than are to be obtained by the use of either the Bhopal or the Rohilkhand bel. In Tables V and VI an effort has been made to compare the Patna results with those obtained by Srivastava from the Bhopal and Rohilkhand bels at Belari. It must be noted that the Patna trials did not have either the same facilities or anywhere near the same scientific control as was possible in the case of Belari experiments. In spite of this the results appear to be very encouraging and the writers hope to follow up these lines of investigations during the next crushing season with a view to eliminating the defects as far as practicable. The most important point is that the extreme simplicity and low initial and recurring cost of the process makes it possible for any individual cane cultivator, however small his resources may be, to make his own 'Khand' and thus secure a better return for his cane crop than would be possible from the manufacture of gur which has been and is selling at least in Bihar, below the cost of production. Cost figures have been purposely omitted

as

as the investigations were of a preliminary nature. It is however interesting to note that the total cost of a unit of Patna furnaces, including pans and other appliances, having the same daily capacity as one Bhopal bel is only Rs 114 as against Rs 410 for a Bhopal bel; moreover the Patna furnaces require no extra fuel other than bagasse and trash which is normally obtained from such cane varieties as Co. 213. The fuel obtained is more than sufficient for boiling the juice.

(TABLE V).

S.No.	Particulars.	Patna.	Bhopal.	Rohilkhand.
1.	Yields per 100 cane:--			
	(a) Juice.	63.49	63.94	64.36
	(b) I Rab.	11.05	13.54	13.05
	(c) I Sugar..	5.25	5.97	5.20
2.	Yield per 100 juice:--			
	(a) I Rab.	17.41	21.1	20.27
	(b) I Sugar..	8.28	9.35	8.08
3.	Yields per 100 Rab:--			
	(a) I Sugar per cent. I Rab..	47.55	44.12	39.82
4.	Efficiency I Sugar curing & Drying:- Sucrose in I sugar per cent.			
	Sucrose I Rab.	60.02	61.03	54.81

TABLE VI.
Analysis figures - for Patna, Bhopal & Rohilkhand processes

S.No.	Particulars.	Patna.	Bhopal.	Rohilkhand.
1.	Juice:--			
	(a) Sucrose.	16.40	16.08	16.08
	(b) Brix.	19.15	19.08	19.08
	(c) Purity.	85.65	84.35	84.31
	(d) Invert sugar..	0.74	1.10	1.01
2.	I Rab:--			
	(a) Sucrose..	73.44	69.83	69.59
	(b) Brix.	89.48	87.93	89.02
	(c) Purity.	82.36	79.42	78.17
	(d) Invert Sugar..	8.80	7.81	8.22
3.	I Molasses:--			
	(a) Sucrose..	44.92	44.20	43.48
	(b) Brix.	71.32	74.08	74.51
	(c) Purity.	63.03	59.67	58.25
	(d) Invert sugar..	15.35	13.21	14.02
4.	I Sugar:--			
	(a) Sucrose.	92.71	94.4	97.02
	(b) Moisture.	..	0.51	0.38

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WHITE SUGAR

by

Open Pan Process.

Kirloskar Brothers, Ltd.
KIRLOSKARVADI,
Dist Satara, (India)

REFERENCES

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Kirloskar Press 2000-1-34.

INTRODUCTION

Chapter I

INDIA is one of the largest sugar cane producing countries in the world. The area of sugar cane in India is over three million acres which is approximately one fourth of the total world area under this crop. The seventy-five percent of this area lies in the punjab, U. P. and Bihar. These Provinces are situated in the Sub Tropical regions and the climate (humidity and temperature) and soil conditions are extremely favourable for the cultivation of sugar cane. Bengal stands next in order, Bombay and Madras presidencies followings:

The conditions in India being favourable for the growth of sugar cane, a large area has been utilized for cane cultivation over a long period and as the crop was a paying proposition till lately, the cultivators were bringing larger and larger areas under sugar cane cultivation. The Govt. also helped to increase the area under this crop by opening up new canals like the Deccan canals and a great impetus was given all over India to the growth of sugar cane. In India, the major portion of this cane was mainly used for the manufacture of "Gul" and the prosperity of the cultivator mainly depended upon the prices of Gul. Lately, however, due to the over production of sugar in the world, the prices of sugar went down and along with the prices of sugar, the prices of Gul also went down, so much so, that in the Deccan,

it also further gave an impetus to big financiers to build up large sugar factories in various parts of India. Large factories cannot be started all over as they have their own limitations and the purpose of this pamphlet is to show that the manufacture of sugar is not the monopoly of big financiers only, but sugar can also be manufactured by farmers having limited means at their disposal.

Chapter II

Variety of cane crops raised in India.

Before going into the question of a ial process of manufacture of sugar on a small tle, it will be advantageous to have an idea the sugar cane crop raised in the various pr ces of India.

As mentioned in the previous chapt the major portion of sugar cane crop is ra d in the Northern Provinces of India i. e. th unjab U. P. and Bihar. In U. P. and Bihar, ost of the cane belongs to the thin or mediu ariety with a fairly high percentage of fibre a hence the average recovery of sugar is very w from such cane. In the Bombay and Madr Presidencies, the varieties of cane are of N family (thick varieties) with the result that percentage or recovery is as high as 10.5 per nt while

in Bombay Deccan in a large sugar factory it is 11.28 per cent. The highest percentage of recovery in the Deccan is mostly due to the introduction of new Java varieties viz. E K. 28 and P. O. J. 287. It is chiefly because Java produces only these varieties of cane, that she is able to supply sugar to India at such a low price as Rs. 3/-/- to Rs. 4/-/ per maund C. I. F. any port in India. Attempts are being made in Northern India to introduce these varieties, but after all, the introduction of new varieties will take time. In the meanwhile, the Northern Districts are able to compensate for their poor variety by their low cost of production. The cost of cultivation in U. P. varies between Rs. 80/-/- to Rs. 150/- per acre while the same is Rs. 350/- per acre in the Deccan. The following statement of the analysis of different varieties of cane, as also the analysis of the juice of important varieties will make the matter clear.

Statement showing the analysis of the juice of important sugar cane varieties.

	Analysis of juice				Analysis of Cane		This will depend on the crusher
	Brix reading	Sucrose	Invert Sugar	Purity	Sucrose % in cane	Fiber % in cane	Extraction of juice to cane
Co. 290	22. 14	20. 22	0. 38	91. 33	16. 40	15. 31	63. 28
Co. 213	20. 93	19. 45	0. 27	92. 94	15. 28	16. 89	62. 80
Khadya	18. 62	16. 57	0. 95	88. 98	13. 31	17. 18	60. 68
Pundya	20. 49	18. 46	1. 36	90. 12	15. 99	10. 90	72. 89
E. K. 28	21. 70	20. 39	0. 51	93. 95	16. 58	13. 03	67. 73
P. O. J. 287	22. 18	20. 44	0. 31	92. 16	16. 79	14. 95	63. 67
H. M. 89	22. 16	18. 34	0. 55	91. 42	14. 92	13. 42	67. 75
H. M. 544	20. 9	17. 16	0. 81	92. 55	14. 84	12. 90	68. 73
J. 247	19. 4	18. 5	1. 8	89. 0	12. 42	14. 2	65. 0
Fiji B	21. 8	20. 1	2. 0	93. 0	14. 8	9. 3	68. 0

Statement showing the area under sugar cane and its yield of Gul in India for the years 1931-32 and 1932-33.

Name of Province or State.	Area (acres in thousand)		Yield of cane (tons in thousand)		Yield of Gul per acre (lbs).		Percentage of total area in each province.
	1932-33	1931-32	1932-33	1931-32	1932-33	1931-32	in 1932-33
1. United Provinces ...	1789	1593	2602	2225	3258	3129	52.1
2. Punjab	556	475	415	368	1672	1735	14.4
3. Bihar and Orisa ...	302	282	313	207	2322	2429	9.9
4. Bengal	233	233	454	273	4315	2625	7.0
5. Madras	125	117	346	319	6200	6107	3.6
6. Bombay	101	99	264	254	5855	5747	3.2
7. North West Frontier Provinces	53	44	60	55	2536	2800	1.7
8. Assam	32	31	35	32	2450	2312	1.2
9. Central Provinces ...	26	22	41	35	3532	3564	0.8
10. Delhi	4	3	3	2	1680	1493	0.2
11. Mysore	42	36	39	32	2080	1991	1.2
12. Hyderabad	40	35	76	65	4256	4160	0.9
13. Baroda	2	2	3	3	3360	3360	0.1
TOTAL	3305	2972	4651	3970	3152	2992	
					Average per acre		

Chapter III

Importance of "Open Pan" process in the Agricultural Economy in India.

From the foregoing chapter, an idea can be formed of the variety of cane crops raised in India. It is also seen that to have the best sugar recovery, it is absolutely essential to have better quality of cane and therefore any person interested in the manufacture of sugar, should first try to see what best variety of cane can be raised by him on his farm. It is also seen that due to the grant of protection to sugar and the low price that is obtained for Gul, the attention of many persons has been drawn towards the manufacture of sugar. One process of manufacturing sugar is known as "Vaccum Pan" the resort to which can be had by the people having large resources only. The other process is known as the "Open Pan" or "bel" or "Khand Sari". Even though, the manufacture of sugar by "Open pan" system is abandoned in other parts of the world, as being wastefull compared to the modern factory system, this method forms the most important part of sugar industry in India. The magnitude of this industry and its importance to the general agriculturists in India is evident from

the f igures published in the last Tariff Board

To tion of cane in India (1932-33) is abo ion tons which is utilized as under:

(A)	ing	5500000 tons
(B)	facture of white sugar by factory system...	2897000 tons
(C)	for Gul in refineries	1620000 ,,
(D)	facture of sugar by indigenous open pan process).	5500000 tons
(E)	facture of Gul...	34595000 ,,
	Total	50112000 tons

It i from the above that the manufacture by open pan process forms a major p total sugar manufacture in India a the fact that the manufacture of sugar by cess has not gone down inspite of the twenty-five new factories have been o India, proves that this method is able its own ground.

This has certain advantages over the large fac the first place, resort can be had to ss because it is within the mean the class well-to-do cultivators having to 100 acres of cane area. With an of a small capital of about Rs. 600 cultivator can get a better profit fr cane by manufacturing sugar on his f pared to the price he would get if h manufacture Gul or supply the can large factories. It should,

however be borne in mind that this process can never compete with the large factory system nor is it intended to replace it. If, however, certain modifications are introduced in the method of manufacture, such as obtaining first sugar and molassian gul from the first molasses, there is every possibility of gaining a fair margin of profit by manufacturing sugar by this process.

The detailed process of manufacture of sugar and the machinery required for this process will be discussed in the succeeding chapters.

Chapter IV

The equipment required for the erection of a small sugar factory.

After due care has been taken in raising a fine variety of sugar cane crop, the next question for setting up a small sugar factory is the selection of proper machinery.

The following equipment is required for the manufacture of White Sugar by the "Open pan" or "Bel" system.

(a) An efficient furnace for the manufacture of Rab.

(b) Two to five pans for the boiling of juice according to the "Poona" process or Rohilkhand bel process.

(c) A powerful crusher for the extraction of juice.

(d) An oil engine of 12 to 15 B. H. P.

(e) One pug mill.

(f) One sugar centrifugal machine.

(g) One grinding machine.

(h) Other accessories such as shaft, pulleys, plummer blocks, etc. and other sundry materials such as:

(1) Laddles;

(2) Empty Kerosene tins.

(3) Thermometer.

(4) Syringe, etc.

With the help of the above equipment, the manufacture of sugar can be undertaken without much difficulty. The merits of some of the equipment mentioned above are given bellow.

(A) Efficient furnace:

In northern India, different furnaces such as

(1) Rohilkhand furnace.

(2) Bhopal furnace.

(3) Cawnpore furnace etc.

have been built up with the special advantages of boiling juice of their cane which contain higher impurities. These furnaces are intended for boiling juice in pans varying from six to eleven. It is believed that the gradual heating of the juice helps clarification and accordingly the number of pans are arranginged. The last

striking pans are 1″ to 2″ in thickness as it is presumed that better crystals are obtained in thick pans. In Deccan, the varities of cane are fairly rich in sucrose with low percentage of fiber, the resulting purity of juice being higher. The juice does not require greater chemical treatment for clarification. It is therefore sufficient to have single, double and multiple types of Poona furnaces for the purpose of preparing 'Rab" from the Deccan cane.

In selecting an efficient furnace the following points should always be borne in mind.

(a) The boiling must be as quick as possible so that the time-factor which is so responsible for the inversion of sucrose into glucose may be reduced to a minimum.

(b) The working capacity of the furnace must be as high as possible, as it will lead to a great saving in labour and time.

(c) The furnace must be of such a form that best possible clarification is secured by the use of clarifying agents.

(d) The furnace should be able to make gul, or Rab, so that there should arise no necessity for any subsidiary furnace for any of these preparations.

(e) The furnaces must be such that the juice may be clarified without interfering with the work of furnace.

(f) The furnace must be able to reduce the amount of fuel used, to such an extent that the begasse alone if possible may be able to do the boiling. In practice as a rule extra fuel as firewood is sometimes necessary.

(g) There should be no possibility of charring or burning the juice at any stage of boiling.

(h) The furnace must be adjustable to a capacity in proportion to the crop and sugar out-turn to be handled.

(i) The method of firing must be such that the fire may be wholly under control so that quick boiling may be secured when desirable, by quick feeding, and the firing may be slowed down when necessary. This can be secured only when there is no accumulation of unburnt fuel and ashes, in the furnace under the pan.

(B) PANS: With respect to pans there is only one important point viz. whether the pans should be shallow or deep. For storage pans and the second and third pans, in the Rohilkhand bel process deep pans are prefered but for the striking pan where the rab is prepared it is advisable to have shallow pans, so that more surface is heated and boiling hastened. There is much difference of opinion about the size of pans but generally the following dimensions are accepted.

(i) Storage pans: Round or rectangular in shape. Size 6′ by 6′ by 18″.

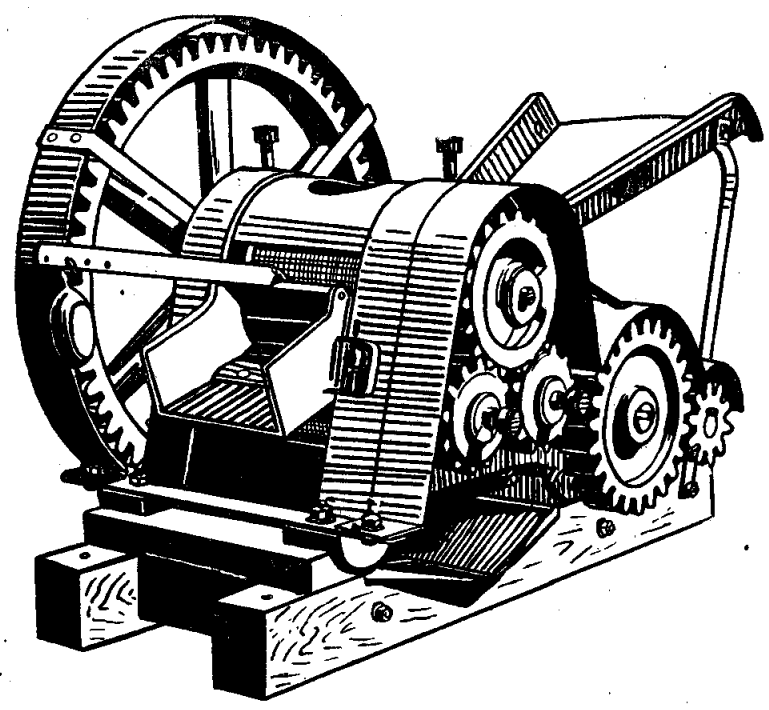
(ii) Boiling pans: Round or oval in shape. Size 8′ by 4′ by 1′.

(iii) Striking pans: in round or oval shape, Size 6′ by 3′ by 1′. The size of Poona pans is fixed and usually are of the round shape, with diameter of 8′ and depth 10″.

(See Vasant Crusher page 13.)

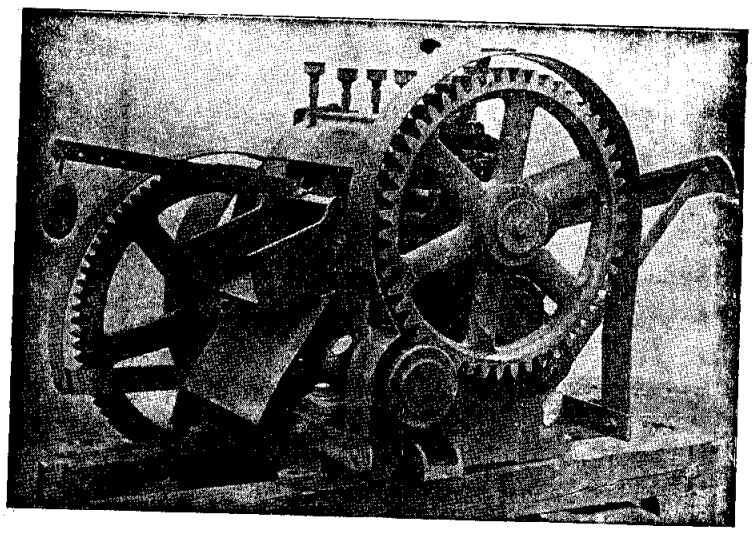
(C) POWER CANE CRUSHERS: Upon the sel ction of the proper crusher depends the whole success of the small sugar factory. In an uptodate modern large-scale factory, the efficiency of the mill house is primarily of great importance. The percentage of juice in cane varies from 85 to 90% (theoretically) and the percentage of fibre varies in different varieties from 10 to 15%. In actual practice in large factories with a mill of 9 to 14 rollers, they obtain 92 to 93% of the total contents—of all available juice which gives the extracts of juice at 81 to 82%.

In a small establishment, however, there is no necessity for having large cane mills having 9 to 15 rollers, but ordinarily three roller cane mills would serve the purpose of the ordinary farmers. In the case of three roller mills, which have no hydraulic arrangement, the percentage of juice to cane is only about 72 in the case of



Kirloskar VASANT Power Crusher

(See Page 14)



Kirloskar SHARAD Power Crusher

(See Page 15)

soft cane like Pundya and about 67% in the case of hard cane like Co. 213. If bullock crushers are used, the percentage is less by about 5°/₀, excepting in the case of bullock driven cane crushers like KAMAL and KARAMAT manufactured by Kirloskar Brothers, Ltd. which give the same percentage of extraction as the power crushers. But for a small sugar factory, there is always an advantage in using a power crusher, as the power crusher crushes more cane and consequently the output is increased.

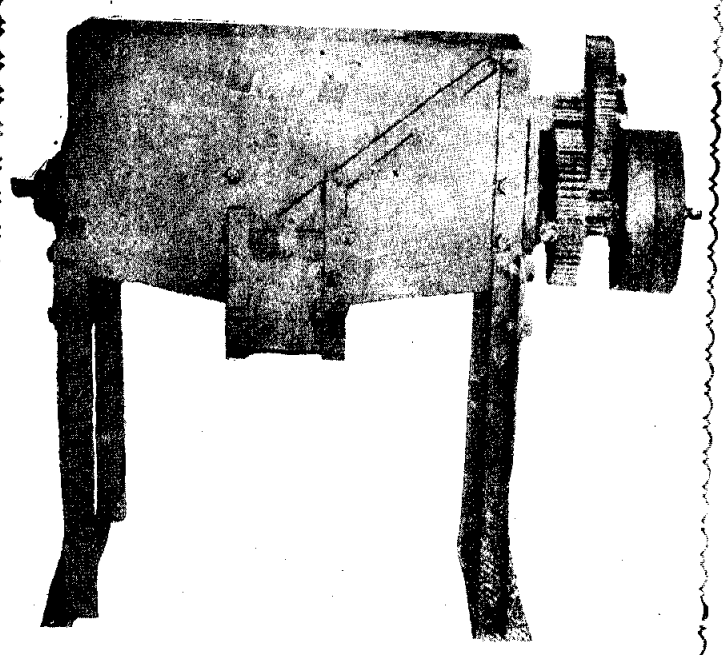
Among the three roller power crushers, there are many manufacturers both Indian and foreign; but taking into consideration the efficiency and the price of the crusher, it can be said without fear of contradiction that the power crushers "VASANT and SHARAT manufactured by Messrs. Kirloskar Brothers, Ltd., are the best and they eminently suit the need of the small sugar factory owners. They require less power and their working is smooth and steady. The VASANT has three horizontal rollers; the size of the King roller is 9"x9" and the size of other two rollers is 6"x9". The power required to work this crusher is only 8 BHP. The SHARAT crusher is a smaller one. It can be worked by a 5 to 6 BHP. engine. Other details of these two crushers can be had by a reference to the manufacturers.

It is common practice to use three roller mills and with a view to obtain a large percentage of extraction, many persons tighten the rollers too much with the result that there is sometimes

a break down of the crusher. It is therefore advisable that the crushers are properly fitted and care should be taken to see that too much pressure is not applied. The grooving of roller is also an important factor and therefore every care should be taken to see that the choice of the crusher is made with proper care. The crushers of Kirloskar Brothers, Ltd., satisfy all the exacting requirements needed by a small factory owner and they are absolutely reliable.

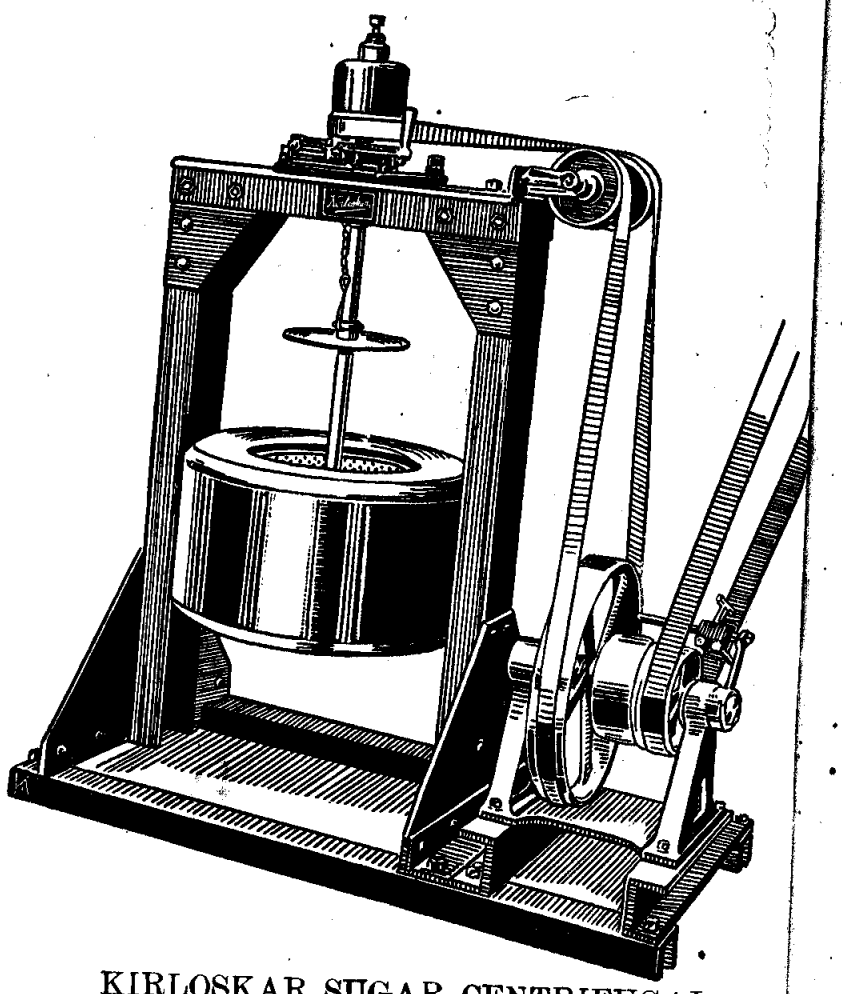
(D) ENGINES:– The oil engine for a small sugar factory should preferably be of a 15 BHP and of a reliable make. A 15 BHP engine can work both the crusher and the sugar centrifugal and in off season, it can also be used for grinding and pumping purposes. It is desireable to have a crude oil engine, preferably cold starting of some renowned make. If a reference is made to Messrs. Kirloskar Brothers, Ltd., they will also be glad to suggest a few names of reliable makers or they would even undertake to supply an engine of reliable make if an order is placed with them.

(E) PUG MILL:– The size of the pug mill will depend upon the quantity of rab to be converted into sugar per hour. Usually a small size of pug mill costing about Rs. 250/–. will serve the purpose. At many places, the work of a pug mill is done by hand.



Kirloskar PUG Mill.

(See Page 16).



KIRLOSKAR SUGAR CENTRIFUGAL

(See Page 17)

(F) SUGAR CENTRIFUGAL:– There are many types of sugar centrifugals available in the market. The choice of sugar centrifugal is of great importance as the final success of the sugar factory will depend upon the efficiency of the crusher and the centrifugal. Among other types of centrifugals, the centrifugals manufactured by Messrs. Kirloskar Brothers, Ltd. is very efficient and reliable and the price charged is very reasonable. The common defect in the cheaper types of centrifugals is too much vibration of the axle. The use of centrifugals is quite common in U. P. and Bihar. The turning out of good sugar depends upon the proper washing of the rab in the centrifugal and the strict observance of other instructions given by the manufacturers. Copies of instructions of using the sugar centrifugals are supplied by the manufacturers with the machine.

(G) GRINDING MACHINE:– This machine is very simple and it will cost about Rs. 150/– In a small factory, an ordinary grinding mill worked by hand will also serve the purpose.

(H) The other accessories such as shafting, belting, ladles, seives, syringes, etc. will cost roughly about Rs. 300/– to Rs. 500/– according to the size of the factory.

It will not be out of place if a rough idea is here given of the total cost of erecting a small sugar factory.

This statement is prepared by Mr. Rattansingh, B. Sc. (Agri.) of Lyallapur (Punjab) who is the manager of Surat sugar factory owned by Harichandsingh, Rais, Lyallpur.

Estimate for complete cane sugar factory (small unit) capable of dealing 150 maunds of cane per day.

1. One 15 B.H.P. engine cold starting crude oil complete with fly wheel, driving pulleys and accessories..... 1800/-
2. One VASANT or SHARAT crusher roll 9" x 9" 700/-
3. One Centrifugal machine 18" basket 700/-
4. One Centrifugal juice lifting pump with piping, etc. 100/-
5. One grinding mill or disintegrator... 150/-
6. Necessary shaft, pulleys, plumber blocks belting, etc.....250/-
7. Set of pans for a Lyallpur furnace with juice storage tank.....160/-
8. A set of pans for 2nd rab furnace...40/-
9. Approximate cost of building furnace (Roofing excluded) 100/-
10. Other accessories (buckets, tube, dories ponies, etc.....100/-

4100/-

11. Approximate cost of building, storage tanks and foundations, etc..... 1900/-

TOTAL 6000/-

Income and expenditure statement.

EXPENDITURE

Interest & depreciation on Rs. 4100/- at 20 %	820
Interest & depreciation on Rs. 1900 at 12%	228
Running charge as per separate list ...	5550
Net profit	1783-4
	8381-4

INCOME

Price of 900 Mds. of sugar at Rs. 9-0-0	Rs. 8100-0-0
6% from 15000 maunds Price of 750 mds. molasses (5% from 15000 mds. cane at 0-6-0 per md.	Rs. 281-4-0
	Rs. 8381-4-0

Details of running charges

1	Crude oil 6 gallons daily	Rs. 350-0-0
2	Cylindrical and lubricating oil	" 150-0-0
3	15000 mds. of cane at 0-4-0 per md.	3750-0-0
4	One mechanic for 5 months	Rs. 125-0-0
5	2 rabmen (one for first and one for second rab	Rs. 250-0-0
6	1 centrifugal man	" 100-0-0
7	1 munshi to maintain accounts	" 100-0-0
8	15 labourers at Rs. 10/- p. m. (2 for weighing cane, 3 on crushers, 2 on fuel and megass, 6 on both furnaces, 1 centrifugal and 1 for frying sugar)	Rs. 600-0-0
9	Cloth strainer, baskets and chemicals for clarification, etc. etc.	Rs. 25-0-0
10	Other expenses	" 100-0-0

It will be seen from these foregoing statements, the erection of a small sugar factory does not cost more than Rs. 6000.

One more estimate of a sugar factory complete with data for the manufacture of sugar, etc. is given below for guidance only. The figures are approximate and they will vary slightly according to the locality of the factory. Also transportation costs are not taken into cosideration.

Capital cost of sugar making apparatus and machinery by the "Open Pan Process"

(A) FURNACE

(i) Cost of erecting one multiple furnace	Rs. 200
(ii) Cost of four boiling storage pans	Rs. 200
(iii) Cost of two cooling pans	Rs. 75
(iv) Cost of three hundred tins for storing rab	Rs. 75
(v) cost of miscellaneous accessories such as ladles, bamboos and others	Rs. 25
(vi) Cost of tin shed over the furnace	Rs. 75
Total	Rs. 650

(B) CRUSHING & MANUFACTURING SUGAR

(1) One Kirloskar Vasant crusher	Rs. 700
(2) One Kirloskar S. L. type 2″ centrifugal pump and pumping connections	Rs. 100
(3) One juice tank	Rs. 50
(4) One 12 B.H.P. crude oil engine	Rs. 1375

(5) One portable channel iron base for the engine without wheels	Rs. 110
(6) Three centrifugal machines of Kirloskar Bros. of 18″×9″ (syringes will be supplied with machines	Rs. 1600
(7) One pug mill	Rs. 250
(8) One grinding mill for the sugar	Rs. 150
(9) Shafting and belting arrangement	Rs. 295
(10) Erection charges	Rs. 200
(11) Ordinary shed over the crusher, engine and centrifugals	Rs. 200
(12) Shed for storing rab and sugar	Rs. 160
(13) Sachharometer, thermometer, hydrometer, etc.	Rs. 10
(14) Three Petre-max lamps, at Rs. 22 each and other ordinary lamps	Rs. 80
Total	Rs. 5250
Total amount from furnace	Rs. 650
Grand total	Rs. 5,900

The cost of the second oil engine of 12 BHP and its portable frame if provided Rs. 1,570

Total Rs. 7470

Working cost of sugar by making by open pan process.

(a) CRUSHING & PREPARING RAB

(1) Cost of crude oil for 16 hours	Rs. 4-0-0
(2) Cost of lubricating oil, greases etc.	,, 2-0-0
(3) Wages of driver and his assistant	,, 1-8-0

(4) Labour charges of crushing cane for 16 pans by contract of as. 3 per hour	„ 3-0-0
(5) Labour charges of Gulvya, and rab, Gul making man at annas 4 per pan	„ 8-0-0
(6) Kerosene oil per lamp	„ 1-0-0
(7) Cost of Siji khar, Bhendi castor seed	„ 1-8-0
(8) Supervision charges	„ 1-8-0
	Rs. 22-8-0

(b) CENTRIFUGALING:—

(1) Cost of crude oil for 16 hours	Rs. 4-0-0
(2) Cost of lubricating oil, grease, etc.	„ 2-0-0
(3) Wages of driver and his assistant	„ 1-8-0
(4) Wages of 2 pug mill workers	„ 1-0-0
(5) Wages of 6 men working at centrifugal	„ 3-0-0
(6) Grinding, driving, sieving, etc.	„ 1-8-0
(7) Supervision charges	„ 1-8-0
(8) Cost of 9 gunny bags at As. 5-4 each	3-0-0
(9) Cost of preparing gul from first molasses	„ 3-0-0
(10) Miscellaneous expenses	„ 0-8-0
TOTAL	21-0-0
GRAND TOTAL...	43-8-0

The preparation of rab and centrifugaling are to be worked on alternate days. By this method the cost of preparing sugar from 16 pans of juice (or from 14 tons of cane) will come to Rs. 43-8-0. This would produce 4400 lbs. of rab,

from which 2000 lbs. of first sugar and 2400 lbs. of first molasses would be produced. This quantity of sugar will fetch Rs. 222-0-0 and if the first molasses be turned into gul. it will give 1680 lbs. of gul of inferior quality which can be sold at Rs. 6-0-0 per palla of 250 lbs. and will realise Rs. 40-0-0. Thus the total receipts will be Rs. 262-0-0 from which the actual cost of 14 tons of cane at Rs. 12-0-0 per ton (Rs. 168) and the working cost of Rs. 43-8-0 should be deduced. The margin of profit will be Rs. 50-0-0 for 14 to 15 Guntas of sugar cane. The profit per acre will be about Rs. 133-0-0.

In one season of about 150 days of working this plant can crush and manufacture sugar from about 1100 tons of cane which will cover an area of nearly 32 acres. If the interest depreciations and repairs of machinery be taken at 7½% and 10% the total cost per season of these two items comes to Rs. 450-0-0 plus Rs. 600-0-0 : Rs. 1,050 0 if this cost is distributed ove 32 acres, the proportionate cost per acre comes to Rs. 33-0-0 and this if deducted from the profit of Rs. 133-0-0 the net profit per acre will be Rs. 100-0-0 or so.

If fresh juice be added to the first molasses, the gul will be proportionately increased, but there is no necessity of taking into account the additional weight of gul, not the price of extra juice. Further this addition will improve the quality of gul and thereby better price for molassian gul can be realised.

If an additional oil engine of 12 B.H.P. be supplied for centrifugal it is possible to crush double the area i. e. 32 acres of cane with an additional cost of Rs. 1600-0-0 only. This will bring the capital cost to Rs. 7500-0-0 and the depreciation will be distributed on an area of 64 acres.

In this calculation the price of sugar and gul is calculated at a low rate viz. Rs. 9-0-0 and Rs. 2-0-0 per maund respectively. The brix reading of cane is taken at 16° to 17° for Adasali cane and 1 ° to 19° for plant cane.

Chapter V

PREPARATION OF "RAB"

Next in importance to the best and most suitable machinery and plant is the question of preparing good "Rab".

After milling the cane by means of an efficient crusher, the juice is first taken to the storage tank by means of a pump where it is heated and the first scum is removed. It is then boiled in the 2nd pan where about one gallon of "Bhendi" (Habiscus esentanties) Musilagnous infusion and a solution of "Suggi Khar" (a mixture of crude sodium bicarbonate and crude sodium sulphide) are added for neutralising the acidity of juice. Special care is taken to remove the scum from time to time and if the juice begins to froth, a slight spray of castor seed pulp is given to settle the impurities. This clarified juice is then taken to the final pan and heated to a temperature varying from 108° c to 114° c. This is called a syrup and is turned into Rab by sudden cooling. The best results are obtained if the cooling is done suddenly. The cooling is generally done by pouring the syrup from one pot to another by means of a big laddle. After the desired amount of crystal formation has taken place, the rab is filled in clear kerosene tins or earthen pots and is kept for five to seven days for complete crystalization.

The Rab varies in texture, size of crystals and glucose contents, viscosity and colour according to the state of maturity of cane, the thickness of juice, the time intervening between extraction of juice and boiling, and the care bestowed on defecation and clarification of juice and on boiling the liquid, the rapidity of latter concentration and the amount of aeration given to the rab before storing it in tins for crystalization.

Good and bad specimens of Rab require different treatment. Rabs can be distinguished under the following heads.

(a) Loose (dhite)
(b) Soft
(c) Closed-boiled-medium (ansate)
(d) Closed-boiled hard (Kani)

For each of the above types special treatment is required in the centrifugals.

It will be advisable to make a note here of a couple of defects in this process.

Unfortunately, in this process, there is no satisfactory arrangement for clarifying the juice such as the sulphitation or carbonation process included in the large modern factories and secondly there is no arrangement for sudden cooling of juice like the "Vaccum Pan" as found in large factories.

After the rab is prepared as described in this chapter it is ready for being turned into white sugar by means of a sugar centrifugal.

Chapter VI

The Manufacture of sugar.

As mentioned in the last chapter, after the "Rab" is filled in the kerosene tins, it should be kept for a week or so for complete crystalization. At the end of this period, these tins are emptied into a shallow trough for breaking the lumps of rab. This operation is either done by hand or by means of a small pug mill. After mixing the "Rab" thoroughly, it should be charged into the sugar centrifugal with the stated amount (information regarding this is given at the end of para 4 in the engineering data of the Kirloskar sugar centrifugals which will be found useful while working the centrifugals). The charging of the rab should be done, if possible, while the machine is running at a slow speed in order to avoid oscillations and excessive wear on the main bearings and the rubber buffers of the centrifugal.

If the rab be exceptionally viscous, it should be mixed with a little first molasses i. e. molasses previously extracted from Rab made direct from juice and not from reboiled molasses and to attain white colour to the sugar, it should be

mixed with a tea spoonful of sodium Hydro-sulphide (blanket).

After the machine is charged with a stated amount of Rab, it should be run at the full rated speed. Then the rab should be washed with a hot water containing a little stannous chloride by means of a syringe. Two or three syringes will usually be found sufficient for ordinary sugar but no set rule can be given, as there is such a large variety of classes of rab.

Excessive washing should, however, be avoided, as otherwise, the sugar will be lost. The machine should be run at the full speed for about fifteen to twenty minutes and until the molasses are completely separated from the crystals. This result is indicated by the molasses coming out of the spout in drops at short intervales instead of in a stream. The machine should then be stopped and it will be found that the sugar is adhering to the main surface of the basket. The central bottom discharge valve should then be lifted and sugar should be scraped out into a receptacle and allowed to bleach in the open sun for a day or two. It is then graded and if necessary ground and filled into bags. For percentage of recovery of sugar see table on page 31.

The following statement gives the engineering data of Kirloskar sugar centrifugals.

Type of Machine	Dimensions of Basket		Fast & Loose Pulleys		Speed of basket	Quantity of rab per charge	Approximate output of cure sugar per hour.	H. P. required.		Price Rs.
	Dia.	Depth	Dia.	Face	RPM			Starting	Running	
K. 9	18″	9″	9″	2½″	2000	70 lbs.	130 lbs.	2	1.5	750
K. 12	18″	12″	9″	2½″	2000	90 lbs.	160 lbs	2.66	2	800

The molasses obtained from the first rab can be converted into "second Rab" by mixing it with waste water obtained from washing the centrifugal and pug mills, and then by boiling the same in the auxiliary furnace, where lime water and sodium hydrogen sulphide are used as clarifying and decolourising agent. The second rab is required to be kept for about a month for complete crystalization. It is then passed through the pug mill and centrifugal, as before, and second sugar and second molasses are obtained. As the percentage of sugar is not more than 1. 75 percent of the weight of the cane, it is not worth while to attempt the second sugar. Further as there is no market for the second molasses, it is not advisable to have second sugar from the first molasses. Instead, the first molasses can be converted into Gul by adding fresh juice and utilising washing soda as a claryfying agent. Fairly good blocks of gul can be prepared from the first molasses by this method and it is sold at half the price of the jaggery.

In the Deccan also small sugar factories worked by open pan process have been started at half a dozen places and it will be interesting to note some figures of their trials for general information.

Sugar Percent of the Cane Used.

	Weight of cane required for boiling	Weight of Juice	Brix reading	Weight of rab.	Weight of first sugar	Weight of first molasses	Percentage of recovery of sugar.	Weight of gul from molasses	Remarks
	lbs.	lbs.		lbs.	lbs.	lbs.		lbs.	
Example 1	1700	1200	20.5	200	120	80	7%	60	Rab struck at 114° C on Poona multiple furnace
Example 2	1700	1200	16.5	209	94	110	5.5%	80	at 109° C on Poona furnace
Example 3	1700	1200	17	210	95	112	5.6%	80	at 110° C on Bhopal Bel Furnace

CONCLUSION

An attempt has been made in this book to bring into a concise form information available from many sources. Due to the price of gul having gone down, the attention of many persons is drawn towards safe-guarding the interests of cultivators of sugar cane and the one way of getting a fair return for the efforts put forth by the cultivator in raising his sugar cane crop is to start small sugar factories in various villages to meet the local demand of sugar. So long as the price of sugar is maintained at a high level, there is no harm in taking advantage of "Open pan" system of preparing sugar.

The information contained in this book is very brief and the purpose will be amply served if sufficient interest is created in the minds of the cultivators to seek further information on this subject from authoritative sources.

So far there has been one more difficulty in the way of small cultivators. No complete estimate for a small sugar factory was available from one source. Messrs. Kirloskar Brothers, Ltd. however are now prepared to furnish and give complete estimate and equipment for a small sugar factory worked by "Open Pan" process and it is hoped that the cultivators will take full advantage of their offer.

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE

61

General and Revenue Secretariat

Dated, Bangalore, 21st August 1936.

No. D 1425

From

The *Secretary to the Government of His Highness the Maharaja of Mysore, Development Department.*

To

The Deputy Commissioner,

Shimoga District, Shimoga.

Sir,

I am directed to acknowledge, with thanks, the receipt of your letter No.A4.C.360-14/36-37 dated 16th August 1936 enclosing a copy of the Note regarding the manufacture of Khandasari Sugar by the Single Pan method as also two photographs taken when the Second Member visited the Colemanpet Colony.

I have the honour to be,
Sir,
Your most obedient servant,

For Secretary to Government,
Development Department.

TSS.

Appendix F G—1]

SUBJECT.....

.....

.....

Diary No. of letter replied to.....

General and Revenue Secretariat

( )

the *193* .

Date of issue 21.8.36

Signed by M. R. Das

List of enclosures.....

Copied by .....

Examined by.....

Section AFE

File No.

Serial No.

No. D. 1425 dt 21/8/36

To

The Deputy Comr, Shimoga Dist.

Sir,

I am directed to acknowledge with thanks the receipt of your letter No. Ah. C. 360-14/36-37 dt 16/8/36 enclosing a copy of the Note re the manufacture of Khandsari Sugar by the Single Pan method as also two photographs taken when the Second Member visited the Colemanpet Colony.

I have etc

20.8.36

for Dev Sec

20/8/36

WD 03601—GPB—30,000—23-9-35

A+E 109-36-1

63

Telegraphic Address:—"INDUSCOM."

GOVERNMENT OF MYSORE.

DEPARTMENT OF INDUSTRIES AND COMMERCE.

In reply please refer to
No. D.6-35
Encl. one note

OFFICE OF THE DIRECTOR,

Dated Bangalore, 14th November 1936.

2541

GEN. & REV. SECRETARIAT
17 NOV. 1936.
DEVELOPMENT BRANCH

FROM

S.G. Sastry, Esq., B.A., M.Sc., F.C.S.,
Director of Industries and Commerce in Mysore,
Bangalore (India).

To

M. Venkatanaranappa, Esq., B.A.,
Secretary to the Government of Mysore,
Development Department, Bangalore.

SIR,

Subject:- Manufacture of Sugar by open-pan system.

With reference to Government Order No.D.3044-54/ A &E 183-33-25 dated 4th November 1936 directing that pending re-examination in due course of starting a new Sugar Factory at Shimoga, action may be taken as far as the Department of Industries is concerned to examine the possibility of establishing in the Bhadra Canal Area one or more small factories employing open pan boiling and power-driven crushing mills and centrifugal machines for making sugar, I have the honour to state that the question has been studied on information obtained from the Department of Industries, Madras, the Agricultural Engineer, Bengal and the Director of Agriculture in Mysore.

I enclose herewith for the information of Government a note as a result of the studies made on the information available from the sources named above showing that the scheme of starting factories of the open pan system for the manufacture of sugar is not a practical proposition under the prevailing market conditions in India and especially in Sourthern India.

I have the honour to be,
Sir,
Your most obedient servant,

Director.

PSS.

Note on small scale sugar factory on open pan system.

The experiment at Singanellur is not complete in as much as it is not tried under field conditions on a sufficiently large scale and that there is no plant in Bagepalli working on the Coimbatore model. From further investigations made on the subject it is seen that large scale factories have developed very much more rapidly than anticipated and competition has set in for securing of the different markets by these factories especially the South Indian market and the price of sugar has been falling. The action of the Dutch Government in devaluating the gilder by 30 per cent to 35 per cent has raised apprehensions of a further fall in prices, vis-a-vis Java Sugar. The Director of Agriculture who was consulted in the matter is of opinion that the sugar made by the open process cannot compare with factory sugar and that the output on cane cannot be more than 50 per cent of the factory recovery and also not more than 50 per cent of jaggery that can be made from a given quantity and that it may only pay when the price of jaggery is about one-fourth the price of sugar. It is also seen that jaggery made from first molasses and additional juice cannot keep good for long. In fact it has to be sold immediately which is not practicable. If second sugars are attempted, the proposition becomes unremunerative. Taking all points into account I consider that it would not be desirable to pursue the pursue the proposition under the present market conditions.

15.1.35

PSS.2.

Appendix F G—1]

SUBJECT.....

.....

.....

Diary No. of letter replied to.....

General and Revenue Secretariat

( )

the *193* .

Date of issue 17th Dec 1936

Signed by Mr. K. Subba Rao

List of enclosures.....

Copied by .....

Examined by.....

Section A&R

File No. 109-36

Serial No. 2

No. D 3901.

To

The Dir. of I & C.

Sir, with refce to your letter no. D.S. 6/35-36 d 14/11/36 re the manufacture of sugar by open pan system, I am directed to invite your attention to the press note of the Dir. of public information, Simla, published in the issue of Madras Mail d 16/11/36 under the heading "Manufacture of Superior Jaggery & Sugar by Open Pan method" & to request you to obtain full particulars & submit a report to Govt.

I have etc

10/12/36

for Dewan

7/12/36.

WD 03601—GPB—30,000—23-9-35

MONDAY, NOVEMBER 9, 1936

MANUFACTURE OF SUPERIOR GRANULAR SUGAR BY JAPAN METHOD

Simple Process Requiring Extraordinary Equipment Costing Only Rs. 24

ADVANTAGES OBTAINED BY USE OF ACTIVATED CHARCOAL

SIMLA, Nov. 13.

[illegible] invented by Rs. [illegible] every [illegible] who grows [illegible] and makes jaggery [illegible] itself a [illegible] manufacturer [illegible] on a small scale, [illegible] issued to-day by the [illegible] Public Information.

[illegible] claim made for the [illegible] of manufacture [illegible] white sugar [illegible] methods evolved by the Imperial [illegible] Institute, [illegible] are not available.

[illegible] feature of the new process [illegible] purification of the raw juice [illegible] activated charcoal [illegible] the new charcoal process [illegible] marvellous way and [illegible] ages of the ordinary [illegible] clarifies and decolourises [illegible] juice to sparkling white [illegible] sion and therefore, keep [illegible] than [illegible] without frothing [illegible] the boiling of large [illegible] juice comparatively [illegible]

ggery of any shade of a lovely cream to a [illegible] and produces a lighter [illegible] which features earlier [illegible] brighter sugar crystals [illegible] obtained by the usual [illegible] process.

ON OF CANE JUICE

[illegible] after filling the [illegible] strained into the [illegible] of clo and heated [illegible] kimmed off. The [illegible] poured to a filter [illegible] of carbo The filter [illegible] ed iron essel of [illegible] empty rosene tin [illegible] the bo om. [illegible] coarse s d or fine gra [illegible] aned a washed of [illegible] is first it into the [illegible] s of 1 1½ inches. [illegible] o inch er of finer s [illegible] r is di ned through [illegible] rs comp . On this la [illegible] mount carbon is too [illegible] nickness f 6 inches [illegible] now re to receive [illegible]

[illegible] ice, afte the prelimin [illegible] over, is owly poured [illegible] carbon but on a sh [illegible] he cart surface, so [illegible] ng in a ontinuous str [illegible] e a pit and disturb [illegible] on. [illegible] juice m not always [illegible] and ma have fine [illegible] d in it. his is due to [illegible] carbon scaping thro [illegible] rbon p es settle [illegible] ompact ed. After a [illegible] n clea uice is seen [illegible] t, the st percolator [illegible] e recei g bucket [illegible] k into t percolator [illegible] s, the ice that [illegible] ater-whi and sparkli [illegible] r efficie the scum [illegible] n the eliminary [illegible] of the olloidal mat [illegible] matter till persist. [illegible] carbon ist and soon [illegible] rvious er on the su [illegible] n bed. hich retards [illegible] . Whe er this is [illegible] should gently rem [illegible] r to one de on the su [illegible] n itself such a wa [illegible] not dist ped.

MOVAL OF SCUM

[illegible] filtered ice is trans [illegible] ng pan and heated [illegible] rms on e surface, a [illegible] o the b consists of [illegible] s of im rities and [illegible] icient c ning at this [illegible] le with the aid of [illegible] or cloth ixed to the [illegible] pontane s floating [illegible] as ceas the addition [illegible] ity (3 o ounces or [illegible] milk im milk [illegible]), dilut with water [illegible] s the q ntity of milk [illegible] re dirt d very finely [illegible] s scum nd this sho [illegible] moved. o make the [illegible] ve, the dle with the [illegible] vashed dipping [illegible] ean wa before each [illegible] herwise. e scum that [illegible] is not emoved and [illegible] ice with he result [illegible] operatio is unnece [illegible] Soon a ge is reached [illegible] s too v ous to perm [illegible] any m scum The [illegible] as wa and boils [illegible] with a easing colou [illegible] r, the n is struck [illegible] nd afte the *rab* is [illegible]

[illegible] alone heat to the [illegible] steady concentra [illegible] al low rise of ter [illegible] so be able to acco [illegible] arge pans to serve [illegible] oncentrators.

ACTIVATED CARBON

Activated charcoal can be prepared from any [illegible] husk, wheat husk, g [illegible] husk, which are useless either [illegible] manure. The process is sic [illegible] little and any of the [illegible] ve methods can be [illegible] alterna

The rice husk is [illegible] carbonising furnace [illegible] heated in closed [illegible] ion furnace. The [illegible] is boiled in caustic [illegible] taining 25 per cent [illegible] tic soda by weight [illegible] free of alkali w [illegible] water, the last tra [illegible] being neutralised [illegible] sulphuric acid. It [illegible] water to remove [illegible] combination of so [illegible] carbon is then dr [illegible] ited again in clos [illegible] ng carbon has [illegible] power and costs a [illegible] this the cost of [illegible] 1 6 and the [illegible] ote. [illegible] 9 per l

In [illegible] ace of soda [illegible] ual alkali in the [illegible] ammonium sulph [illegible] sed without app [illegible] efficiency.

ALTERNATIVE METHOD

An alternative [illegible] stead of 25 lbs. of [illegible] of good lime free [illegible] rial [illegible] 32 lbs. o [illegible] soda per 100 lbs. [illegible] equally good resul [illegible] rials in this case [illegible] carbon works ou [illegible] - 1/6 for the caus [illegible]

Another method [illegible] charcoal with soda [illegible] in the proportion [illegible] closed iron tubes [illegible] charcoal in the co [illegible] of the ashes, the [illegible] being the same [illegible] this stuff works [illegible]

A fourth meth [illegible] soda ash altoget [illegible] furnace ashes an [illegible] it is very impor [illegible] should be free fr [illegible] such as sand, ano [illegible] be concentrated [illegible] first charcoal is [illegible] In this case the co [illegible] ed product works [illegible] but the efficiency [illegible] of the caustic so [illegible]

The charring [illegible] heating operation [illegible] other materials n [illegible] gery furnace its [illegible] of jaggery-makin [illegible] ing in a separate [illegible] washed charcoal [illegible] and may be repl [illegible] carbon to the ac [illegible] a end of ja [illegible] furnace. With [illegible] cost of firewood [illegible] eliminated and [illegible] lb. will vary from [illegible]

Any one interes [illegible] manufacture car [illegible] from the [illegible] the Agricul [illegible]

MANUFACTURE OF SUPERIOR JAGGERY AND SUGAR BY OPEN PAN METHOD

Simple Process Requiring Extra Equipment Costing Only Rs. 24

ADVANTAGES OBTAINED BY USE OF ACTIVATED CHARCOAL

[illegible] of even [illegible] sugarcane and [illegible] make of himself a manufacturer of white sugar on a small scale, says a Press note issued to-day by the Director of Public Information.

This is the claim made for the new process of manufacture of superior jaggery and white sugar by the [illegible] evolved by the present workers of the Imperial Agricultural Research Institute, details of which are now available.

An essential feature of the new process is the clarification of the raw juice by the use of activated charcoal and it is said that the new charcoal process is a marvellous [illegible] advantages over the [illegible] original. It clarifies and decolourises raw sugarcane juice to sparkling white, it retards inversion and, therefore, keeps the juice longer than usual. It induces smooth boiling without frothing and so enables the handling of quantities of juice in smaller pans.

It gives [illegible] colour [illegible] uniform heat to the bottom so that there is [illegible] concentration without abnormal local rise of temperature. It should be [illegible] to accommodate one or two [illegible] to serve as 'storage' and slow concentration.

[illegible] husk, which [illegible] are useless either as feed or fuel. The process is simple and costs very little and any of the following alternative methods can be employed.

The rice husk is first charred in the carbonising furnace and, if necessary, heated in closed iron pipes in the ignition furnace. The carbon, so produced, is boiled in caustic soda solution containing 25 per cent. of commercial caustic soda by weight. It is then washed [illegible] with clean water, but [illegible] the last traces of residual alkali being neutralised with hydrochloric or sulphuric acid. It is again washed with water to remove the salt formed by the combination of soda with acid. The carbon is then dried in the sun and [illegible] again in closed pipes. The resultant carbon has a high decolourising [illegible] costs about -/2/1 per lb. Of the cost of materials comes to [illegible] the cost of labour, [illegible] per lb.

[illegible] to remove the residual stage of washing, [illegible] solution may be [illegible] reduction in

[illegible]

[illegible] jaggery-making. Also the final heating [illegible] washed charcoal may be dispensed with [illegible] may be replaced [illegible]

MONDAY, NOVEMBER 16, 1936

66

MANUFACTURE OF SUPERIOR JAGGERY AND SUGAR BY OPEN PAN METHOD

Requiring Extra ing Only Rs. 24

ANNED BY USE OF CHARCOAL

uniform heat to the bottom so that there is steady concentration without abnormal local rise of temperature. It should also be able to accommodate one or two large pans to serve as 'storage' and slow concentrators.

ACTIVATED CARBON

Activated charcoal or carbon can be prepared from any farm refuse like rice husk, wheat husk, groundnut husk, which are useless either as feed or manure. The process is simple and costs very little and any of the following alternative methods can be employed.

The rice husk is first charred in the carbonising furnace and, if necessary, heated in closed iron pipes in the ignition furnace. The carbon, so produced, is boiled in caustic soda solution containing 25 per cent. of commercial caustic soda by weight. It is then washed free of alkali with clean sweet hot water. The last traces of residual alkali are neutralised with hydrochloric or acetic acid. It is again washed with water to remove the salt formed by combination of acid with alkali. The carbon is then dried in the sun and ignited again in closed pipes. The resulting carbon has a high decolourising power and costs about -/2/4 per lb. Of this the cost of materials comes to -/5 and the cost of labour, -/-/9 per lb.

In place of soda to remove the residual alkali in the final stage of washing, ammonium sulphate solution may be used without appreciable reduction in efficiency.

ALTERNATIVE METHOD

An alternative method is to use, instead of 25 lbs. of caustic alkali, 12 lbs. of good lime free from [illegible] plus 32 lbs. of soda ash or [illegible] soda per 100 lbs. of raw charcoal, with equally good results. The cost of materials in this case per lb. of finished carbon works out to -/-/8 as against [illegible] the caustic soda process.

[illegible] is to heat the first charcoal with soda ash and lime ashes in the proportion of [illegible] lbs. in [illegible] iron trays in to boil the last charcoal in the concentrated lixiviations of the ashes, the subsequent operations being the same. The cost per lb. of this stuff works out to -/-/3 per pound.

A fourth method is to dispense with [illegible] altogether and to use only [illegible] and lime lixiviations, but it is very important that the furnace should be free from [illegible] material [illegible] and the lixiviations should be concentrated sufficiently before the charcoal is added to it and washed. This gives the cost per lb. of the finished product works out to less than -/-/3, but the efficiency is much less than that of the caustic soda product.

The charring of the husk and other [illegible] materials may be done in the large furnace itself during the [illegible] jaggery-making. Also the final heating [illegible] charcoal may be dispensed with and may be replaced by [illegible] due to the [illegible] of one [illegible]

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE 67

General and Revenue Secretariat

No. D. 3901/A & E 109-36-2 *Bangalore, Dated,* ~~16th December 1936~~ 17th

From

The *Secretary to the Government of His Highness the Maharaja of Mysore, Development Department.*

To

The Director of Industries and Commerce in Mysore, Bangalore.

Sir,

With reference to your letter No.D.5.6/35-36 dated 14th November 1936 regarding the manufacture of sugar by open-pan system, I am directed to invite your attention to the Press Note of the Director of Public Information, Simla, published in the issue of Madras Mail dated 16th November 1936 under the heading "Manufacture of superior jaggery and sugar by Open Pan Method" and to request you to obtain full particulars and submit a report to Government.

I have the honour to be,

Sir,

Your most obedient servant,

K Sumana

for Secretary to Government,
Development Department.

Telegraphic Address: "INDUSCOM."

DEPARTMENT OF INDUSTRIES AND COMMERCE.

In reply please refer to
No. D5:202/36-37.
Encl.

OFFICE OF THE DIRECTOR,
Dated Bangalore, 1st February 1937.

FROM

S. G. SASTRY, ESQ., B.A., M.Sc., F.C.S.,
Director of Industries and Commerce in Mysore,
Bangalore (India).

To

M. VENKATANARANAPPA, ESQ., B.A.,
Secretary to the Government of Mysore,
Development Department, Bangalore.

SIR,

Sugar Factory at Shimoga.

* * *

With reference to the Government Order No.D.3044-54/A&E.183-33-25 dated 4-11-1936 on the above subject and directing me to submit proposals for the deputation of an Officer to study the working of the special plants for manufacture of sugar, I have the honour to state that there will be demonstrations in open pan system of sugar boiling from all British Provinces at Lucknow Exhibition. I have placed Mr. K. V. Govinda Rao, Mechanic of the Department who has been deputed to Lucknow in connection with the Exhibition, on special duty, to attend the demonstrations and submit a report in the matter. Under the circumstances, I am of opinion that there is no necessity to depute another Officer till after the receipt of the report from Mr. Govinda Rao and examined by me.

I shall submit a further report in the matter as soon as I receive the report from the Mechanic.

I have the honour to be,

Sir,

Your most obedient servant,

S. G. Sastry

DIRECTOR OF INDUSTRIES & COMMERCE

1 FEB. 1937

Submit for perusal. Further report will be awaited.

3-2-37

DEVELOPMENT BRANCH

A+E 109-36 — RR 4033 '69

Tels {Phone No.—211
Grams —INDUSCOM.

In reply please quote number, date & short title

GOVERNMENT OF MYSORE

DEPARTMENT OF INDUSTRIES AND COMMERCE.

From (Name) M. S. RAMCHENDRA RAO, ESQ., B.A.,

(Designation) Director of Industries and Commerce,

Station Bangalore.

To

M. VENKATANARANAPPA, ESQ., B.A.,
Secretary to the Government of Mysore
Development Department, Bangalore

GEN. & REVENUE SECRETARIAT, 25 JAN DEVELOPMENT BRANCH.

No. D5. 6/35-36 Dated 27th Jany. 1938.

Enclosures.....

.....

SIR,

Manufacture of superior jaggery and sugar by open pan system.
*****

With reference to your letter No. D.5240/A&E.109-36-R on the above subject, I have the honour to state that I recently visited at Mhow (Central India) a newly started factory for the manufacture of sugar by the open pan method on the lines advocated by Mr. Peterson, Agricultural Engineer of Bengal. I am collecting statistical and other information about the working of this concern and as soon as I am in possession of it, I shall submit a detailed report for the orders of Government.

I have the honour to be,

Sir,

Your most obedient servant,

M S Ramchendra

DIRECTOR.

The report may be awaited.

BV2)

Tele { Phone No. 2004
Grams—INDUSCOM.

In reply please quote number, date & short title

GOVERNMENT OF MYSORE

DEPARTMENT OF INDUSTRIES AND COMMERCE.

FROM (Name) M.S.Ramchendra Rao,Esq.,B.A.,
(Designation) Director of Industries and Commerce in Mysore,
Station Camp:Chikkanayakanahalli

To

P.H.Krishna Rao,Esq.,M.A.,
Secretary to the Government of Mysore,
Development Department, Bangalore.

No. Ds-6/36-37.

Dated 1st October 1939.

Enclosures

GEN. & REV. SECTT. -3 OCT. 1939 AGRI. & FOREST BRANCH.

SIR,

[illegible]

With reference to correspondence ending with your letter No.D.5240/A & E.109-36-R dated 24th January 1938, and in continuation of my letter of even number dated 25th January 1938 on the above subject, I have the honour to state that the main advantage claimed for the method of manufacturing sugar by the open-pan method is that it lends itself to small-scale production while the yield and quality of sugar will stand comparison with sugar made in large-scale factories.

My enquiries go to show that none of these claims can be substantiated. It is true to a certain extent that the cost of equipping a factory for making sugar by the open-pan method is much less than in the case of a full-fledged sugar factory and that the size of the equipment may be adjusted to the financial capacity of the proprietor or proprietors. But it cannot be maintained that the extraction of juice from the cane will equal the optimum results obtained in large-scale factories; while the combined yields of first and second sugars are never likely to be more than 7% as against 10% or more in large-scale factories.

(PTO)

The quality of sugar in appearance, grain and cleanliness is, however, not much inferior to factory-made sugar.

The experiments carried out so far in other parts of India have neither been continuous nor such as to lead encouragement to the adoption of the process on a large scale. Mr.Peterson, Agricultural Engineer, Bengal, claims to have designed furnaces and machinery and devised some methods of making sugar which are stated to compare favourably with large-scale factory practice. But from what I saw of the factory established by one Mr.Byramshaw K.Illava at Mhow under Mr.Peterson's guidance, I found that there was nothing novel in the machinery used, neither in construction of the furnace nor in the use of the boiling pan. The yields, both in the case of sugar-cane crushing mill as well as of first and second sugars nowhere approached the figures claimed by Mr.Peterson which are set out below:-

Juice extraction percentage : 70% to 70.1
Percentage of rab to cane : 13% to 14%
Percentage of first sugar to rab: 48% to [illegible]
Percentage of first sugar to cane: 7%
Percentage of second sugar to cane: 2.27%
Total recovery percentage of first and second sugars: 7.64% to 8.57%.

Though I have tried to get definite and reliable data of the working of the method in other centres I have not succeeded in doing so.

Even the smallest unit of a mill for making sugar by the open-pan method will cost in the neighbourhood of Rs 5,750, which is fairly excessive to induce people to take to sugar making in preference to making of jaggery.

The Mysore Agricultural Department has recently successfully demonstrated the manufacture of cream (white) jaggery by using activated carbon. This is likely to prove a more attractive proposition in view of low first and recurring costs. At the present time a further factor operating against making of sugar on a small-scale is the very attractive prices jaggery is fetching in all parts of the country. So long as these high prices continue, even the sugar factories are likely to suffer for want of a regular

(contd.)

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Development Secretary to Government.

regular and adequate supply of cane.

Taking all these circumstances into consideration I am of the opinion that the question may be dropped for the present.

I have the honour to be,
Sir,
Your most obedient servant,

DIRECTOR.

STS

"COMMERCE AND INDUSTRY".

29th October 1935.

BENGAL SUGAR INDUSTRY.

The Bengal Government have been taking keen interest in the improvement of the sugar industry hoping to relieve unemployment in the Province by its development. They feel that the improved 10-ton gur and sugar mill which has been introduced by the Bengal Agricultural Department would be quite suitable and profitable. This factory can deal with 250 maunds of cane a day and manufacture 35 maunds of rab a day from this cane, if the quality of the cane is good.

Detailed calculations have been made to show that with an outlay of Rs.15,000 it would be possible to effect a turnover of about Rs.2,300 a season if the factory crushes to its full capacity of 250 maunds and work 120 days in the season.

The Government of Bengal have also given an assurance that industrialists requiring help for the erection of this type of factory would receive it from the Agricultural Engineer of Bengal and the Bengal Agricultural Department. Help would also be given during the working of the factory, and what is more, if necessary, a few experienced hands on moderate salaries would be provided by the Department to work the factory in the first season and to teach local labour.

'EXTRACT'

"COMMERCE AND INDUSTRY".

29th October 1935.

BENGAL SUGAR INDUSTRY.

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'EXTRACT'

76

Government of his highness the Maharaja of Mysore.

GENERAL AND REVENUE DEPARTMENTS.

G. O. No. D. 3044-54—A. & E. 183-33-25, dated 4th November 1936.

Sugar Factory at Shimoga.

Passes orders on the report of the Committee constituted to go into the question of starting a ——.

READ—

Government Orders Nos. D. 6543-49—A. & E. 183-33-11, dated the 10th April 1935 and D. 7604-12—A. & E. 183-33-12, dated the 24th May 1935, constituting a Committee consisting of the following members to investigate into the question of starting a Sugar Factory at Shimoga :—

1. The Revenue Commissioner in Mysore (*Chairman*).
2. The Director of Agriculture in Mysore.
3. The Deputy Commissioner, Shimoga District.
4. N. Rama Rao, Esq., B.A., B.L., Retired Director of Industries and Commerce.
5. H. Siddaiya, Esq., B.A., B.L., Advocate, Shimoga.
6. The Proprietor, M.A.T.Z., Dada Mian Sahib & Co., Shimoga.
7. The Director of Industries and Commerce.
8. The Superintending Engineer, Shimoga Division.

2. Government Order No. D. 1670-76—A. & E. 183-33-17, dated the 10th September 1935, appointing Mr. R. Ananthasubrahmanyam, Secretary, the Mysore Sugar Company, as Secretary of the Committee referred to in the Government orders read above.

3. Letter No. C. 4292—34-35, dated the 21st April 1936, from the Revenue Commissioner and Chairman, Shimoga Sugar Factory Committee, submitting the report of the Committee on the prospects of starting a Sugar Factory at Shimoga.

4. Correspondence ending with letter No. C. 4292—34-35, dated the 25th June 1936, from the Revenue Commissioner, furnishing information regarding the freight charges per ton of cane from the different places in the Shimoga area to the Mandya Sugar Factory and the estimated cost of constructing the roads referred to in the report of the Committee adverted to above.

5. Un-official Note, dated the 18th August 1936, from the Chairman, the Mysore Sugar Company, Limited, on the subject.

ORDER No. D. 3044-54—A. & E. 183-33-25, DATED BANGALORE, THE 4TH NOVEMBER 1936.

The proceedings and report of the Committee are printed as annexures to this order.

2. The Committee addressed itself in the main to a consideration of the question whether the area under sugarcane in the Shimoga and adjoining Taluks could be increased to such an extent as to justify the establishment of a Central Sugar Factory for the tract. They have come to the conclusion that, in all, about 3,000 acres irrigated by the Bhadra Canal, the Anjanapur Reservoir and some of the minor tanks might be brought under sugarcane cultivation and that this would provide an assured supply of raw material for a factory capable of handling 400 tons of cane per day and operating about 100 days in a year.

3. Government observe that some of the areas which the Committee had in view, are considerably more than ten miles distant from a Railway Station, which the Committee considered to be the maximum distance for the economic transport of cane. It would seem that, even if the roads suggested by the Committee were constructed, the cost of transporting cane to Shimoga would, on the average, be much greater than is the case in the Mandya area, while in some instances, it would be prohibitive. At the same time, the relatively small size of the factory and the unavoidable shortness of the milling season are factors calculated to increase the cost of manufacturing sugar at Shimoga.

4. It is understood that the general conditions in the sugar industry are, at the moment, somewhat unsettled. The selling price of sugar has shown a downward tendency for some time past. Signs of increasing competition on the part of Indian

Factories to secure the sugar markets in Southern India are noticeably in evidence. And pending the result of the tariff enquiry to be shortly instituted for the purpose, some uncertainty is felt as to the level of protection that may be granted to the industry in future.

5. In these circumstances, Government have come to the conclusion that the further consideration of the scheme for establishing a new factory at Shimoga should be deferred. But pending its re-examination in due course they direct that action be taken on the following lines :—

(1) The Department of Industries and Commerce should examine the possibility of establishing in the Bhadra Canal area one or more small factories employing open pan boiling and power-driven crushing mills and centrifugal machines. It is understood that several types of such plants adopted for the manufacture of white sugar as well as jaggery of a good second class, are operating successfully in some Provinces of British India. The Director of Industries and Commerce is requested to submit proposals for the deputation of an officer to study the working of these special plants and suggest which type or types could be introduced with advantage in the Shimoga District on an experimental basis.

(2) The Department of Agriculture should make detailed enquiries with a view to ascertaining the average yield and sugar content of cane now grown in the area, the means of improving its cultivation and the possibility of prolonging the milling period beyond 100 days.

(3) The Mysore Sugar Company, Limited, will be requested to consider whether arrangements can be made for the purchase of cane from the Bhadra Canal area for the Mandya factory.

The Chairman of the Mysore Sugar Company, Limited, who has been consulted in the matter, disagrees with the Committee's suggestion that the Company should ensure to the Bhadra Canal raiyats a net price per ton equal to what the raiyats get in the Irwin Canal area. He also points out that the railway freight charges from Bhadravati to Mandya are at present so heavy that unless the Mysore Railways could quote a more favourable rate, the sale of cane to the Mandya Factory would not be attractive to the growers who have necessarily to bear these charges.

Government recognise the force of these observations. The Company cannot be expected to pay an enhanced price for sugarcane in order to encourage its cultivation in the Shimoga District. But before definitely concluding that the purchase of cane in this area will not be mutually satisfactory to the growers and to the Mysore Sugar Company, it is suggested that the Company might consider the possibility of opening a purchase depot at Shimoga for one or two seasons and perhaps also of making advances to reliable growers on the usual terms, and see whether these advantages will enable some at least of the growers to offer regular supplies of cane to the Mandya factory at acceptable prices. The Agent, Mysore Railways, is requested to report whether and to what extent it is possible to reduce the railway freight on sugarcane from Bhadravati to Mandya, at least as a temporary measure.

The Chief Engineer of Mysore is requested to examine the question of improving communications in the areas commanded by the Bhadra Channel and the Anjanapur Reservoir, and to submit his views to Government along with the necessary estimates.

M. VENKATANARANAPPA,

Secretary to Government,
Development Department.

To—The Revenue Commissioner in Mysore.
The Director of Industries and Commerce in Mysore.
The Agent, Mysore Railways.
The Chief Engineer of Mysore.
The Chirman, the Mysore Sugar Company, Ltd.
The Director of Agriculture in Mysore.
The Deputy Commissioner, Shimoga District.
The other Members of the Committee.

Exd.—C.K.

WD 851—GPB—482—16-11-36.

REPORT OF THE COM
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No. D. 3044-54—A. & E. 183-33-25, DATED 4TH NOVEMBER 1936.

ANNEXURE.

REPORT OF THE COMMITTEE APPOINTED BY GOVERNMENT TO REPORT ON THE PROSPECTS OF A SUGAR FACTORY AT SHIMOGA.

Government in their Order No. D. 6543-49—A. & E. 183-39-11, dated 9—10th April 1935 appointed an *Ad-Hoc* Committee to investigate the question of starting a Sugar Factory at Shimoga, with special reference to the adequacy of cane supply, the existence of markets and the financial results in the existing conditions of the Sugar Industry in India.

The Committee held two meetings, one on the 31st May 1935 and the other on the 13th January 1936, in the Deputy Commissioner's Office at Shimoga.

At the first meeting, the Committee expressed their opinion that detailed investigations should be made in order to ascertain the areas, within a radius of 15 miles of the Factory site at Shimoga, where sugarcane is available or can be grown, the varieties of cane grown, the yield of jaggery per acre and the transport facilities available in respect of each area. The Committee also considered the size of the Plant, the possible duration of the milling season and the estimated outturn that will be available for disposal.

The Committee were of opinion that taking the normal milling season to be 100 working days, the Factory to be put up should have an average crushing capacity of 450 tons per day. They were also inclined to think that the disposal of 4,500 tons of sugar—the estimated outturn per annum—might not constitute any serious problem for the new concern, although this addition to the available supply of sugar was likely to lower prices.

At their second meeting, some valuable information regarding the area available for growing cane was placed before the members and a Note prepared by the Revenue Commissioner, attached as annexure to this Report, was also considered. The members expressed themselves in entire agreement regarding the observations contained in the Note. The Committee felt that the soil conditions in the Shimoga District were very much better than in Mandya and that with the same fostering care and assistance, as is given to the raiyats in Mandya, it should be possible gradually to increase the average yield of cane per acre.

Certain information regarding cost of cultivation was furnished by Mr. Rama Rao and it was generally agreed that if proper facilities were created for the disposal of the crop, it should be possible for sugarcane growers to obtain a reasonable return. It was considered essential that in the interests of the development of this area, sugarcane cultivation should be encouraged which could only be done if facilities similar to what have been afforded to the raiyats in the Irwin Canal area are created by the starting of a Factory.

The Committee considered that Shimoga would be the most suitable place for the location of a Sugar Factory and that it would be possible to obtain an area of 3,000 acres every year under cane under the Anjanapur tank and the Bhadra Channel and within ten miles of the nearest railway station. They considered that the yield of cane from this area would be sufficient to keep a Factory of 400 tons crushing capacity during a milling season of 100 working days. The Committee feel that in the interests of the development of irrigation works created in this area and also keeping in view the contemplated Lakkavalli Project, a Sugar Factory on lines similar to what has been organized for the Irwin Canal area should be started in Shimoga.

If, for any reason, Government consider they cannot give effect to this proposal at once, the development of sugarcane cultivation in this area need not be delayed or postponed. They feel that Government should arrange with the Sugar Factory at Mandya for creating facilities in this area for the cultivation of sugarcane, such as, opening depots for the purchase of cane and the supply of manure, the grant of advances, etc., to the raiyats, the Company securing to the raiyats a price which would represent a net return equivalent to what the raiyats in the Irwin Canal area are now getting. This arrangement may go on until conditions favourable for the establishment of a Factory are established.

No. D. 3044-54—A. & E. 183-33-25, DATED 4TH NOVEMBER 1936.

Proceedings of the First Meeting of the Committee appointed by Government Order No. D. 6543-49—A. & E. 183-33-11, dated 9—10th April 1935, to investigate the proposals for starting a Sugar Factory at Shimoga, held on 31st May 1935, in the Deputy Commissioner's Office, Shimoga.

PRESENT.

1. N. Madhava Rao, Esq., B.A., B.L., Revenue Commissioner in Mysore (*Chairman*).
2. H. F. Marker, Esq., L.C.E., M.R. San. I., Superintending Engineer, Shimoga.
3. S. Abdul Wajid, Esq., B.A., Director of Industries and Commerce in Mysore.
4. Dr. B. Narasimha Iyengar, B.A., Ph.D., Director of Agriculture in Mysore.
5. T. V. A. Isvaran, Esq., B.A., Deputy Commissioner, Shimoga.
6. N. Rama Rao, Esq., B.A., B.L., Retired Director of Industries and Commerce.
7. H. Siddaiya, Esq., Advocate, Shimoga.
8. Zinulabdin, Esq. of M.A.T.Z. Co., Shimoga.

The Government Order appointing the Committee was read and the points of investigation were taken up for consideration.

As regards the availability of cane, Mr. N. Rama Rao made some preliminary remarks, and observed that it was reasonable to expect about 3,000 acres under sugarcane every year within a radius of 15 miles from Shimoga. He thought that having regard to the cost of cultivation of sugarcane, the price that a Factory could afford to pay and the cost of transport, about 15 miles would be the limit from which supplies could be drawn. This would include 500 acres under Bhadra Channels and 200 acres under Sowlanga.

The Superintending Engineer said that the area under sugarcane under channels in 1934-35 was 172 acres showing an increase of 40 acres in five years. He also stated that there were 5,600 acres under command of tanks within a radius of 7 miles from Shimoga.

Mr. Rama Rao said that much land fit for sugarcane was at present not being cultivated with that crop owing to difficulties of milling and disposal of output. With the facilities that would result from starting a Factory, it was highly probable, he thought, that all eligible lands within the reach of the Factory's operations would be cultivated with sugarcane.

It was agreed that a detailed investigation should be made in order to ascertain the areas within 15 miles of Factory site, Shimoga, where sugarcane is grown, or could be developed. The varieties of cane grown, the yield of jaggery per acre and the transport facilities available in respect of each area should also be ascertained. The Deputy Commissioner and the Superintending Engineer undertook to have the investigation made and obtain a report of the results, together with a map, for the information of the Committee.

During the next milling season, the Agricultural Department may have detailed enquiries made in some typical villages as to the yield of cane per acre and the sugar contents of the same.

The size of the Plant to be put up, the duration of the milling season, and the estimated outturn, and its disposal were also considered.

Cane is usually planted between January and April and the harvesting period will be the corresponding four months in the following year. Allowing for weekly cleaning, the milling season will be 100 working days and the Factory should have an average crushing capacity of 450 tons of cane per day.

The Committee were inclined to think that the disposal of 4,500 tons of sugar, the estimated outturn per annum, might not constitute a serious problem for the new concern, although this addition to available supplies was likely to depress prices.

Mr. Rama Rao placed certain figures regarding the estimated cost of cultivation and the probable return to the raiyats by supply of cane to a Factory and the probable financial results of the working of a Factory with the above capacity. These figures will be circulated and considered at the next meeting.

No. D. 3044-54—A. & E. 183-33-25, DATED 4TH NOVEMBER 1936.

Proceedings of the Second Meeting of the Committee appointed by Government Order No. D. 6543-49—A. & E. 183-33-11, dated 9—10th April 1935, to investigate the proposals for starting a Sugar Factory at Shimoga, held on 13th January 1936, in the Deputy Commissioner's Office, Shimoga.

PRESENT.

1. K. V. Anantaraman, Esq., B.A., Revenue Commissioner in Mysore (*Chairman*).
2. S. Abdul Wajid, Esq., B.A., Director of Industries and Commerce in Mysore.
3. Dr. B. Narasimha Iyengar, B.A., Ph.D., Director of Agriculture in Mysore.
4. S. Narayana Rao, Esq., M.A. (Hons.), Deputy Commissioner, Shimoga District.
5. N. Rama Rao, Esq., B.A., B.L., Retired Director of Industries and Commerce.
6. H. Siddaiya, Esq., Advocate, Shimoga.
7. R. Ananthasubramanyam, Esq., B.A., B.L. (*Secretary*).

The Chairman observed that the Committee at their previous meeting were of opinion that the Sugar Factory for economical working should be one of 400 tons crushing capacity per day and taking an average of 100 days as the working season, this would require an annual area of at least 3,000 acres under cane. It was also decided that detailed investigations should be made in order to ascertain the areas within 15 miles of Shimoga where sugarcane was grown or where sugarcane cultivation could be developed to secure the above area, the varieties of cane grown, the yield of jaggery per acre and the transport facilities available.

The Deputy Commissioner and the Superintending Engineer, Shimoga, have sent in detailed reports furnishing statements of the atchkats under tanks within 15 miles of Shimoga. The Superintending Engineer states that the total wet atchkat under tanks is about 44,000 acres and that under the Bhadra Right Bank Channel, about 3,000 acres can be brought under irrigation, which means that about 1,000 acres will be available here for cane cultivation every year.

The Deputy Commissioner has furnished details of the various atchkats under tanks and channels. He considers that under Bhadra Channel, 3,000 acres can be brought under cane cultivation, while under tanks, not more than 5,000 acres can be counted upon. As regards yield of jaggery, the Deputy Commissioner estimates the average yield per acre at 80/100 maunds. As regards transport facilities, from information furnished, more than 50 per cent of the villages, where cane is grown under tanks, are situated on the roadside or at a distance of a mile from the nearest road.

The Director of Agriculture has submitted a report stating that from the analysis of sugarcane in the area he finds that neither the local pattapatti nor HM-320 is ripe enough at the time of the meeting, *viz.*, January. The Assistant Director of Agriculture who visited the areas estimates the average crop at not more than 15 tons per acre, with certain good patches which promise to give a yield of 30 tons per acre.

The Chairman then mentioned that he visited the areas with a view to ascertain firsthand the extent of lands available for cultivation of sugarcane. A Note prepared by him (enclosed as an annexure to this) was read before the meeting.

As a result of his investigation, he found that with the improvements to roads in the area, it would be possible to have 1,500 acres under the Bhadra Channel and 1,000 acres under the new Anjanapur Project, while at least 500 acres could be counted upon under tanks. Most of the areas will be within 10 miles (roughly) of Kumsi or Bhadravati Railway Station. He also said that it would be possible to make Government lands available in the area for grant to the Factory.

The Committee expressed itself in entire agreement with the observations made by the Chairman in his note and were of opinion that it should be quite possible to get an area of 3,000 acres every year for cultivation of sugarcane within accessible distances by railway from Shimoga. They also considered that the improvement to

roads suggested in the President's Note should, in the interests of the development of the Malnad, be taken up at once by the District Board and Government.

The Committee then considered the fact of the prospects of a Factory in the present position of the sugar industry in India. In this connection, certain information regarding the present sugar market conditions and the trend of prices was furnished to the members. It was pointed out that due to increased production of sugar and internal competition, there was a tendency for the prices to fall. On the other hand, the view was also expressed by certain members of the Committee that the total production of sugar in India was not equal to the total demand and that there was also the prospect of sugar displacing jaggery.

The Committee feel that though with the imposition of Excise Duty and the fall in prices of sugar due to internal competition, the prospects of a 400-ton Factory may not be so bright as it would have been if it had been started two years ago, yet with the growing demand for sugar, and in view of the fact that the demand in Southern India as a whole is very much more than the local production and that conditions in Mysore are conducive to large yields in cane, the prospects of the Factory working successfully are good.

The Committee considered that the peculiar conditions of the Malnad and the prospects of further development of irrigational facilities there justified the grant of encouragement for growing sugarcane and the establishment of a Sugar Factory.

The Committee further considered that in case the starting of a Sugar Factory—which should be done with Government aid—is delayed for any reason, the creation of facilities for the development of sugarcane cultivation in the area need not be delayed and that facilities should be created for the granting of advances to enable raiyats to grow sugarcane with Government aid. The Committee understand that the Mandya Factory can be expanded so that it may deal with the cane that will be grown on an area of 3,000 acres, and that as a first step towards the development of sugarcane cultivation, the Mandya Sugar Factory may be requested to set up the necessary organization to render financial assistance to the sugarcane cultivators and undertake to purchase cane from them on terms similar to what they give at Mandya, the net resultant price that is obtained by the raiyats in Shimoga being not less that what the raiyats in the Irwin Canal area get.

NOTE.

On the 19th and 20th November 1935, I inspected the following places:—

(1) Bhadra Anicut and Canal.
(2) Colemanpet and lands cultivated by the colonists.
(3) Sulekere tank and channels.
(4) Anjanapur Reservoir, and
(5) Sowlanga tank.

2. The first point for consideration is where the new Sugar Factory should be established—whether at Bhadravati or at Shimoga. Shimoga seems to me to be the better place for the following reasons:—

(1) The principal areas from which supplies of cane can be obtained are the Anjanapur and the Bhadra Canal areas. Shimoga is equidistant to both.
(2) Facilities for securing labour are better at Shimoga.
(3) Conditions of health would seem to be better at Shimoga.
(4) It is undesirable to concentrate too many Factories at Bhadravati, as such a course is likely to force up wages.

3. I consider that an assured supply of cane can be obtained only from the Bhadra Canal and the Anjanapur areas. I do not think that a steady and guaranteed supply can be obtained from the lands irrigated by tanks. In the current year, the monsoon has been so poor that the tanks have not received an appreciable supply of water. Under Sowlanga tank, after the standing sugarcane crop is cut, sugarcane cultivation cannot be undertaken for lack of water. It does not seem to be prudent to depend very much on a supply from such uncertain areas. So far as Sulekere is concerned, no doubt, a considerable extent of cultivation can be attempted under it; but the area is too far. It is about 35 miles from Bhadravati. The road is fairly good, but the distance is far too much.

No. D. 3044-54—A. & E. 183-33-25, DATED 4TH NOVEMBER 1936.

4. The total extent irrigated by the Bhadra Canal is about 8,000 acres. In the calculations made by the Director of Agriculture, it has been assumed that summer irrigation will be limited to the first 18 miles of the channel which command about 3,000 acres. He has indicated 1,000 acres as the extent that can be grown with sugarcane in a year. After carefully studying the conditions in this area, I think that we may expect a larger extent than 1,000 acres, if certain improvements to communications are made. I understood from the Assistant Engineer in charge that summer irrigation was not limited to the first 18 miles. Water goes much lower and is being used. There is at present a road leading from Bhadravati to Babbali. There is a road leading from Holehonnur for a few miles towards Babbali. If the intervening five or six miles of road are built, there will be a continuous road from Bhadravati to Holehonnur. If this is done, another 500 acres under sugarcane may be obtained from the lower reaches of the channel. Even if the summer supply should be precarious, it will not be a serious matter, because there are tanks under the channel in this area in which the water required for summer supply can be stored at the tail end of the monsoon. There is a big tank at Koppa near Holehonnur in which the channel empties itself. It may be possible to get a substantial extent for cane cultivation under this tank.

5. As far as the Anjanapur area is concerned, the Executive Engineer in charge is of opinion that 1,000 acres or more under sugarcane may be secured there. He is hopeful of letting water down for six miles of the channel early in 1936. This area is situated at a distance of 26 miles from Shimoga. The distance is rather long; but this difficulty may be removed by constructing a road from Anjanapur to Kumsi on the Shimoga-Sagar Railway. The distance will be about 12 miles. There is an existing track which may be improved. There are no serious difficulties to face in the construction of this road. The cane can be removed in lorries in Kumsi and thence taken on by train to Shimoga.

6. My anticipation therefore is that it will be possible to get about 1,500 acres under Bhadra Canal and about 1,000 acres in the Anjanapur area. About 500 acres from lands irrigated by tanks may also be counted upon. The deficiency under tanks, if any, can be made up by an increase under Anjanapur. There will thus be no difficulty to get about 3,000 acres under sugarcane for this Factory.

7. So far as the yield is concerned, the Director of Agriculture assumes that it may be taken at about 20 tons per acre. I saw the improved variety of sugarcane grown by the Bhadra Colonists. I must say that it looks as good as any in and around Mandya. The Director of Agriculture has observed that the land is of superior quality to that in the Mandya area.

8. From the foregoing facts, it will be seen that it is quite possible to establish a Factory with very good prospects of success, taking only into consideration the availability of cane suitable in quality and adequate in quantity.

9. There are other considerations which have to be borne in mind in this connection, *viz.*, whether there will be overproduction of sugar in the State. That is a point on which I am unable to offer any remarks. Perhaps, the authorities of the Mandya Factory will be able to advise us in this matter. The size of the Factory may perhaps be determined with reference to this consideration.

10. There are certain considerations which have been impressed upon me forcibly, and which I should like to place on record. The conditions of the cultivation under the Bhadra Canal at present are very unsatisfactory. The lands are situated in a very unhealthy area and are infested with wild beasts. There are no proper roads and the problem of transport is a very difficult one. This area has got to be opened up if the full advantages of this irrigation work are to be secured to the Government and to the people. If a Sugar Factory is opened and ready means of disposing of a valuable money crop, like sugarcane, is assured, it will put a lot of money into the pockets of the landowners.

11. The construction of the Lakkavalli Reservoir is under active consideration and the experience that is gained by an intensive effort to develop the Bhadra Canal will be of great value when the development of irrigation under the Lakkavalli Reservoir comes up for consideration.

12. In both the Bhadra Canal and the Anjanapur areas, Government lands are available for grant to the Sugar Company, if necessary.

K. V. ANANTARAMAN,
Revenue Commissioner and Chairman.

App. F. IX-4

Previous References.
ge 76-38-1-5

1939.
(ge)

File No. 428-39
Serial Nos. 1-2

Later References.
ge 428-39-3
ST. 2-40 (1-4)
ST 35-40 8h/18.
ge 405-44 (116)

GENERAL AND REVENUE SECRETARIAT.

Serial Nos. two

100

Part B for Feb 40

SUBJECT.

Extension of the provision of Act IX of 1916 to the Bangalore Woollen, Cotton & Silk mills Provident Fund Scheme

Notifies in the Gazette

28/2

1474

The revised Rules of the [illegible] now
sent up by the Bills provide for
1) deposit of the amount at the
credit of the [illegible] in response
to notice also
2) no extension of the period of
[illegible] by the members
of the fund for [illegible]
years.
3) increase of the subscription
and contribution by [illegible]
and the Bills respectively
from 5 to 6½ %
2226 4) limiting the membership to employees of some
employers [illegible] have already agreed
to extend [illegible] of the Employees
Provident Funds Act IX of 1925 to this
F. fund [illegible] dated [illegible] 1925
the Bills) [illegible] it is actually instituted.
5) Draft notfn. extending the [illegible]
S[illegible] as no fund has been instituted
[illegible] from [illegible]
5. Which is the object of Rule 9?
[illegible] some [illegible]
[illegible] inserted by [illegible]

7689

Rule 8 of the proposed fund provides for the repayment of the amount at the credit of any member after five years and Rule 9 proposes to limit such repayments to ordinarily to not more than 10% of the total no. of members of the funds, thus restricting the withdrawals of membership.

[illegible] for perusal [illegible] to members [illegible] at [illegible]

9/2

The object is probably to prevent a "run" on the fund. May they be asked [illegible]?

G 9/2

Not necessary.

The draft notification may issue.

[illegible]

B
15/2

9Fc 428-39-1

3

THE BANGALORE WOOLLEN, COTTON & SILK MILLS CO. LD.

TELEGRAPHIC ADDRESS:
WOOLLEN BANGALORE.

TELEPHONE No. 2037.

BANGALORE CITY, 29th January 1940.

Decision with compliments

The Chief Secretary
to the Government of Mysore,
BANGALORE.

GEN & REVENUE DEPARTMENT
31 JAN
DEVELOPMENT BRANCH

2949

9Fc 76-38
8-1-4
B for Feb 39

Sir,

We have the honour to inform you that we propose to introduce a Provident Fund Scheme B for the benefit of our employees from 1st February 1940 and enclose a copy of the relative Rules.

It will be seen that this scheme applies to all our employees drawing less than Rs.100/- a month and will ensure that on the expiry of their service workpeople will be able to draw a substantially greater amount than they would do under the existing Gratuity Fund Scheme. The Provident Fund B Scheme will make a compulsory saving from employees' wages which otherwise might be liable to be dissipated by them.

We desire to obtain the recognition of Government before bringing the scheme into force and we shall be grateful if the Government, in exercise of its powers under Section 6 of the Mysore Provident Funds Act

IX of 1916, will extend the provisions of the said Act to our Provident Fund R.

We wish to have the provisions of this Act applied to our Provident Fund so as to make the compulsory deposits not liable to attachment by Courts of Justice and not liable to the claims of a Receiver in insolvency proceedings.

We shall be grateful if you will give this matter consideration at an early date.

Yours faithfully,

[illegible]

[illegible]

IV.

The Bangalore Woollen, Cotton & Silk Mills Co., Ltd.

PROVIDENT FUND "B"

FOR

WORKPEOPLE.

CONSTITUTION AND REGULATIONS.

THE NELSON PRESS, BANGALORE.

The Bangalore Woollen, Cotton & Silk Mills Co., Ltd.

PROVIDENT FUND "B" FOR WORKPEOPLE.

CONSTITUTION AND REGULATIONS.

1. The fund shall be called "The Bangalore Woollen, Cotton & Silk Mills Co., Ltd., Provident Fund B for Workpeople", hereinafter referred to as "the fund" and its object is to provide each member of the fund with a sum of money, the source and amount of which will be ascertained by the following rules, on the termination of his service with the Company.

2. In these rules, unless there be anything repugnant in the subject or context:—

(i) "The Company" shall mean The Bangalore Woollen, Cotton & Silk Mills Co., Ltd., Bangalore.

(ii) "Contribution" shall mean any payment or transfer of money or securities for money to the fund and shall include any simple or compound interest earned thereby in the fund. "Company's contribution" shall include any sum transferred from the Gratuity Fund to this fund Provided however that any sum so transferred from the Gratuity Fund, with interest accrued thereon, shall on and from the date on which (according to the Gratuity Fund Rules, had those rules still remained applicable) the

Gratuity Fund amount would have become payable to the member, be deemed to be a member's contribution.

(iii) "The Directors" shall mean the directors for the time being and from time to time of the Company and shall include the directors in board meeting assembled.

(iv) "Member" shall mean any full time worker in the employment of the Company who during his employment is admitted to the benefit of the fund, has signed the Roll of Members and a copy of these rules in token of acceptance thereof and regularly contributes to the fund.

(v) "Nominee" and "Nominees" shall mean any person or persons as the case may be appointed in writing by a member to receive the amount that may become payable from the fund to the member in the event of the member's death before such member shall have otherwise ceased to be in the service of the Company, provided that such writing has not been cancelled by the member by any later writing. The latest appointment in writing shall be deemed to revoke all earlier appointments.

(vi) "Salary" shall include wages and shall mean the monthly earnings of a worker inclusive of any perfect piece bonus or any bonus based on production during any particular month or leave allowance but shall not include any half-yearly cash bonus that may be declared

(whether provided for monthly or half-yearly) by the Directors or any perfect attendance bonus, any special allowance or any contribution by the Company to the fund or any gratuity.

(vii) "The Trustees" shall mean the trustees of the fund.

(viii) "Worker" shall not include any present or future apprentice or any employee of the Company below the status of a full time worker or **anyone** on probation or on temporary service or any employee who is in receipt of a monthly salary from the Company of Rs. 100/- or more.

3. These rules shall commence to operate from the 1st day of.....1940.

4. The trustees of the fund shall be the directors.

5. Any full time worker may apply to the trustees for membership of the fund and, on his being admitted by the trustees as a member thereof, the Company shall be entitled to deduct monthly from his salary 7½% thereof and shall pay the same monthly to the trustees as part of the member's contribution to the fund to be credited provisionally to that member's separate account in the fund: Provided however that no member shall be allowed to contribute to the fund after having completed twenty seven years full time service with the Company if he shall still be then in the service of the Company. The Company shall at the end of each half year pay the trustees out of its own funds a contribution equivalent to 7½% of all contributing members' salaries paid

for that half year, to be credited proportionately and provisionally to the individual accounts of the members.

6. On and from the said 1st.....1940 the amount provisionally entered up to that date in the Gratuity Fund book of each worker who becomes a member shall be transferred to the account of such member in the fund constituted under these rules and the amount so transferred shall be a Company's contribution and shall so remain until the date on which under the proviso to rule 2 (ii) above it shall be deemed to be a member's contribution and shall after such transfer be dealt with in accordance with these rules. On and after the said 1st.....1940 no member shall have any prospective or other claim whatsoever upon the said Gratuity Fund.

7. All contributions except in so far as the trustees shall require to make any payment in cash out of the fund for audit fees, expenses of administration or under these rules, shall, upon receipt by the trustees be invested in and only in such securities as are mentioned or referred to in clauses (*a*) to (*e*) of Section 20 of the Indian Trusts Act, 1882, and in such securities as by the law of the State of Mysore trustees may invest, the interest thereby earned being credited proportionately to the individual accounts of members, and each member shall be provided at the expiry of each six months of his membership with a statement shewing the total amount provisionally at his credit on the previous 30th June or 31st December, as the case may require.

8. The total contributions standing provisionally to the credit of a member shall not become payable to him unless and until he shall have served the Company continuously for

a period of not less than five years according to a certificate of the Mill Manager which shall be conclusive as to the facts therein stated and until the termination of his service with the Company: Provided that after 27 years of full time service with the Company no further contribution from the member or from the Company provisionally or otherwise for credit of his account shall be required or can be insisted on by any person concerned.

9. The trustees shall not be bound in any one year to make payments from the fund to more than ten per cent of the total number of members but at their discretion may make payments to a number in excess of that percentage.

10. If any member shall die, be discharged or dispensed with owing to lack of sufficient work or otherwise or leave the service of the Company before he shall have completed five years continuous service with it as certified by the Mill Manager or shall at any time be dismissed by the Company for any reason and particularly for the member's conviction by any Court on a charge of crime or misdemeanour in any way affecting the Company or any of its property, assets, works, acts, officers or servants, for participating in any illegal strike, for contravening any of the Company's rules for workpeople, or for any misconduct or negligence, then he shall cease forthwith to be a member and he or the nominee or nominees of a deceased member shall not be entitled to receive any contribution made by the Company and provisionally credited to his account in the fund which shall forthwith be repaid by the trustees to the Company and he or his nominee or nominees as the case may be shall be entitled to receive from the trustees only his own contributions to the fund, less any sum which may then be found due

by him to the Company or any sum due to Government for income tax.

11. No contribution by the Company to the fund or any part thereof shall be assignable by a member or be the subject of any alienation, mortgage, charge or attachment and upon any member purporting to alienate, assign, mortgage or charge any contribution whatsoever to the fund or upon any creditor of any member applying to any Court for attachment of any contribution whatsoever to the fund, thereupon the member shall cease to be a member and shall forfeit all claims upon the fund except to his own contributions thereto less income tax (if any) due therefrom, and the Company's contributions provisionally made to his account shall forthwith be repaid by the trustees to the Company.

12. Should any Government at any time during the subsistence of the fund enact any legislation requiring the Company compulsorily to contribute to any other fund or to pay any levy, tax, assessment, rate or other single or recurring charge from its own capital or income, for any unemployment, health, retirement or other benefit of any of the Company's employees for the time being or from time to time, then the Company shall be at liberty forthwith to reduce its rate of contributions to the fund by an amount equivalent to the Government's said levy, tax, assessment rate or charge if the latter be equal in amount to not more than 7½% of members' salaries and if it be equal to more than 7½% of such salaries then the Company shall be at liberty forthwith to cease making any further contributions whatsoever to the fund.

13. Nothing in these rules contained shall in any way be taken as restricting the powers of the Company at any

time to dispense with the services of, discharge or dismiss any of its employees or workers.

14. The trustees shall be at liberty at any time after not less than fourteen clear days' notice in writing put up on the Notice Board at the Mill, to alter, amend or modify any of the rules of the fund except rule 12 above so however that no part of a member's own contribution thereto shall be made payable to the Company except for (1) debts outstanding due by the member to the Company and (2) income tax (if any) paid or payable by the Company or the trustees on the member's behalf; and, should any question at any time arise as to the true interpretation of the rules for the time being of the fund, the opinion of the directors shall be final and binding on all parties.

Form of Declaration.

I, ...hereby declare that in the event of my death the undermentioned $\frac{\text{person}}{\text{persons}}$ shall be entitled to receive payment of any amount which may become payable to my nominee or nominees under the above Rules.

Signature.

Witnesses :

1.

2.

I, ...hereby declare that I have had read over to me and I understand the Rules of The Bangalore Woollen, Cotton & Silk Mills Co., Ltd., Provident Fund ''B'' for Workpeople as hereinbefore set forth, that I agree to be bound by the same as one of the terms of my employment and that I shall have no claim whatsoever on the Gratuity Fund of the Company.

Dated day of 1940

GOVERNMENT OF HIS HIGHNESS THE MAHARAJA OF MYSORE.

No. ..... General and Revenue Secretariat,

Dated Bangalore ..... 193 .

NOTIFICATION.

Appendix F 6—1]

SUBJECT.....

Diary No. of letter replied to .....

General and Revenue Secretariat

( )

the 193 .

Date of issue 11/2/

Signed by .....

List of enclosures .....

Copied by .....

Transmitted by .....

Section IRC

File No. 428.39

Serial No. 2

No. fn

In exercise of the powers vested in them under Sec. 6 of Act IX of 1916, the Govt. of H.H. the Maharaja of Mysore are pleased to extend the provisions of the Act to the Provident Fund Scheme B instituted by the Bangalore Woollen, Cotton & Silk Mills Ltd., for the benefit of their employees from 1-2-1940.

By Order,

Dep Secy

To The Comptroller, M.G.

Copy to the Dir. IRC
& the Managing Dir.
B.W.C.&S. Mills Ltd.

WD 0563—GPE—30,000—[illegible]